

December 1987/January 1988

# AIR & SPACE

Smithsonian

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**T**hey called it quixotic. Impossible. It had never been done. Not even dared.

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It hadn't been easy. Not even for seasoned pilots who make a routine of record-breaking. Rutan, a retired Air Force lieutenant



*The revolutionary aircraft Voyager.*

## Voyager, Rolex, and one of the last great challenges of long-distance flight.



*Record-breaking pilots Jeana Yeager and Dick Rutan.*

colonel, and Yeager, a drafting engineer, already held numerous world-distance and closed-circuit titles.

Yet much more than their exceptional personal skills was required to capture this laurel. A radically new plane had to be created by Burt Rutan, Dick's renowned aircraft-designer brother.

Voyager, the revolutionary craft he conceived, has a wing-

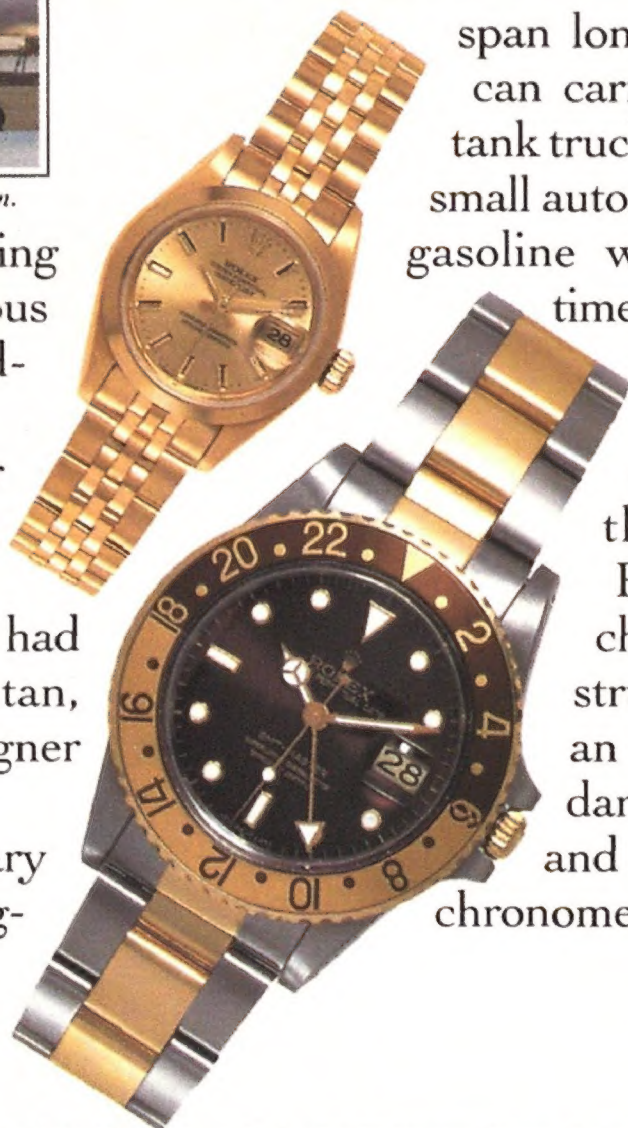


*Voyager's irregular flight path, chosen to vector it around strong winds.*

span longer than a 727's and can carry as much fuel as a tank truck. Yet it's lighter than a small automobile. At takeoff, the gasoline weighed almost four times as much as the 2200-pound plane itself.

Because of the critical need to keep their aircraft light, Rutan and Yeager chose a minimum of instruments. Among them, an automatic pilot, a radar weather unit,

and Rolex chronometers.



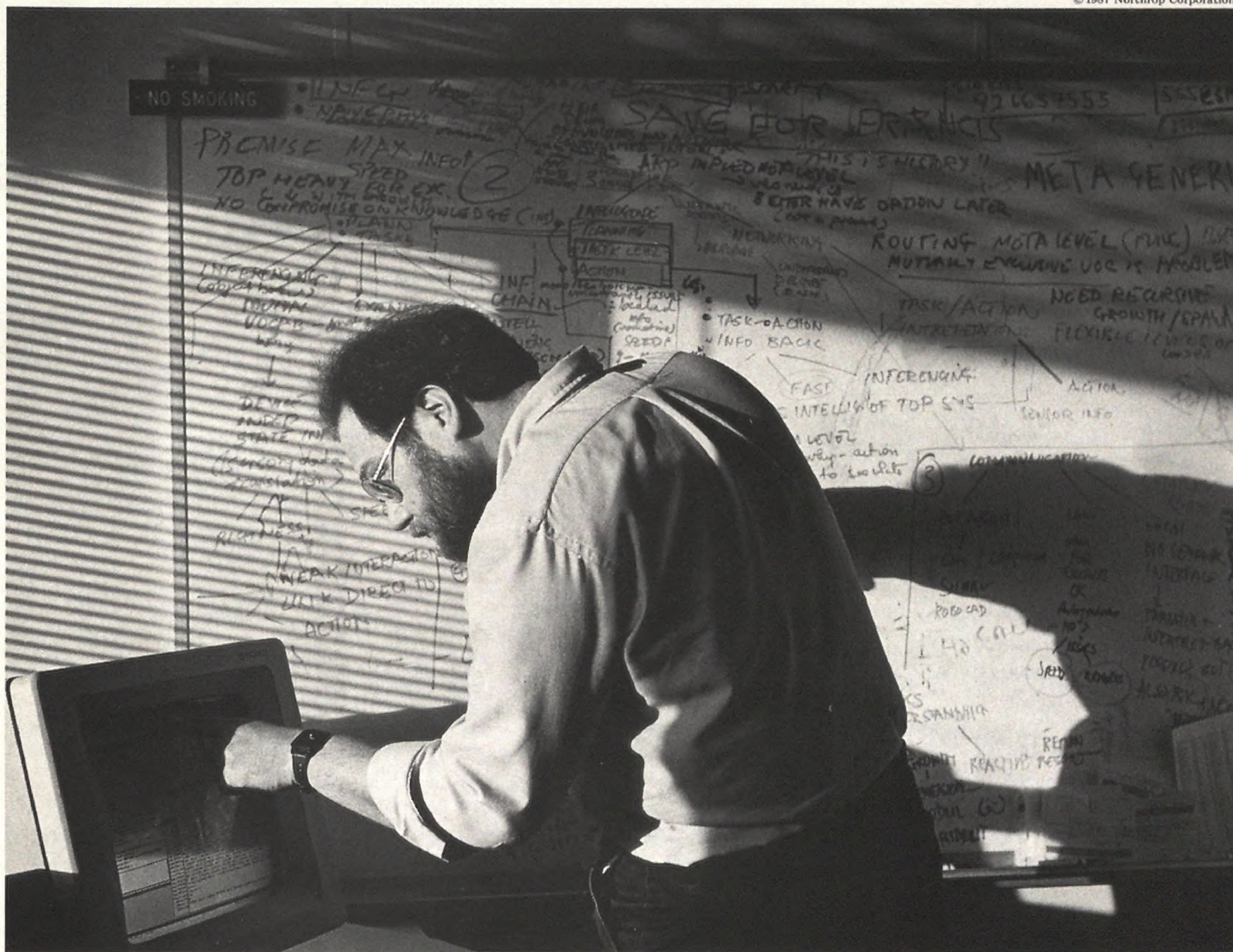
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## Contents

- 4 **Viewport**  
*Making the Cut*  
by Robert C. Mikesch

- 8 **Letters**  
*Identity Crisis*

- 12 **Soundings**  
*Reno's race, Boeing's secret,  
Bangkok's NASA*

### 36 Destination Schiphol

by Ian Keown  
photographs by Ruud Taal/  
Capital Press

*In Amsterdam, you can shop in 40 tax-free stores, worship in 25 languages, visit an aviation museum and an aircraft factory, and even drop in on one of six farms—all this without ever leaving the airport.*



### 48 Soviets Blaze Sky Trail over Top of World

by Von Hardesty

*In 1937, the American press relished reporting this Arctic adventure, with its chills, thrills, and a landing that surprised everyone, including the crew.*



- 22 **Calendar**  
*Anniversaries and Events*

- 26 **In the Museum**  
*Movies, experimenters, and a mural*

- 30 **Flights & Fancy**  
*Escape and Rescue*  
by Edwards Park

- 32 **Above & Beyond**  
*Ski Lift*  
by Stephan Wilkinson

### 56 Essay: The International Space Year

by Harvey Meyerson

*A plan to commemorate the 35th anniversary of Sputnik with global activities may help foster new Space Age ideals.*

### 60 Up from Africa

text and photographs by  
Robert Caputo



*The breezes over the Masai Mara carry the scents of the grasslands, the calls of African big game, and the tourist-laden air yachts of Balloon Safaris, Ltd.*

### 66 The California Rocket Race

by T.A. Heppenheimer

*Fortunes and egos will grow astronomically if Silicon Valley entrepreneurs can launch their home-grown vehicles into orbit.*

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## 74 The Flight Against Evil

by Jay P. Spenser

*Captain Midnight, heroic fictional flier of yesteryear, has been given a new lease on life by his onetime sponsor, Ovaltine. Find out why in nine action-packed pages of adventure!*

## 84 Flexible Fliers

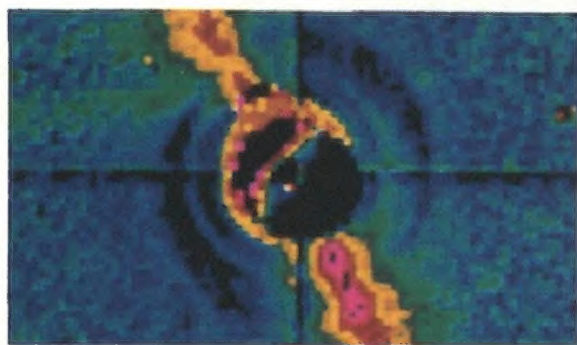
by Michael Rozek  
photographs by Brownie Harris

*From its humble kitchen-table beginnings, Francis Rogallo's vision of an inexpensive portable aircraft has evolved into popular hang gliders.*



## 88 Seeing Red

by Stephen P. Maran



*In 1800, William Herschel used a simple thermometer and prism to prove the existence of infrared light. Since then, instruments ranging from high-altitude balloons to the Infrared Astronomical Satellite have been revealing new visions of the universe.*

## 96 When Pilots See UFOs

by Dennis Stacy  
illustrations by Pierre Mion

*If unidentified flying objects do exist, aviators would be in a good position to observe them. That's why perceptual psychologist Richard F. Haines has been studying thousands of pilots' reports of UFO sightings.*



104 Groundling's Notebook  
*Hang Time*  
by Richard Corrigan

108 Reviews & Previews  
*Gift books and others*  
edited by Katie Janssen

111 Smithsonian Travel

114 Credits & Further Reading

115 "The Satellite Sky" Update

116 Forecast



Cover: *Captain Midnight* was a man for all media, from comic books to television. (Courtesy Library of Congress)



## Making the Cut

The airplane business is doing well at the National Air and Space Museum. An average of one or two airplanes per week are offered to the Museum for sale, trade, or donation. But because the Museum's collecting must follow a well-thought-through plan, only four to seven airplanes are accepted each year. Recent acquisitions include the late Art Scholl's aerobatic championship aircraft and the last of the Navy's Vought Crusaders.

Most Museum acquisitions are donated. The Museum does not buy aircraft: no funds are budgeted for purchases. Trades take place only rarely, when surplus non-combat military airplanes become available and the transaction is approved by the General Services Administration.

Most aircraft donations are prompted by the owner's recognition of the significance of his or her airplane. Perhaps the craft is a record-setter, or the last of a classic variety. More often, because the owner has personally restored the airplane or has grown attached to it over years of flying, he or she would rather see it in a museum than in the hands of another individual. What better place for a special airplane than the National Air and Space Museum?

Obvious personal associations make it more difficult for members of the Aeronautics Department to turn down an offer. Often the staff members faced with these sensitive decisions have similar associations and experiences.

Of course, the simplest solution to the Museum's collecting quandaries would be to acquire an example of every type of aircraft. Since this is obviously impractical, the staff has created a collections-rationale plan. Most aircraft fall within one or more of the plan's 18 categories, which include ultralights, sport and corporate aircraft, air transports, and military jets. To keep the collection balanced, each category is subdivided by time periods. Summaries within each category list the aircraft that are already in the collection and those needed to fill any gaps. The plan makes it easier for the staff to evaluate a potential acquisition and determine whether it has a place in the Museum's collection.

The plan also helps curators identify airplanes that should be actively sought. For example, the Museum used to acquire most of its military aircraft almost literally from the junkyard, much abused and stripped of everything of value. Now we have determined the significant types of current military aircraft that the Museum should acquire, and have even identified specific airplanes with interesting backgrounds by serial number. We have asked the Department of Defense to donate these particular airplanes to the Museum when they are no longer needed for military service.

When the people using the chosen aircraft learn that it will someday be in the National Aeronautical Collection, they start taking special care of it. When these craft are transferred to the Museum, all the equipment except for classified technology is left intact so that the systems and components can be preserved. In most cases, the airplane makes its last flight to an airfield in the Washington, D.C. area to minimize ground transportation.

Older aircraft are harder to find. The collection is weak in classic air racers and military aircraft of the period between the world wars, and there is little hope of strengthening it. High on the Museum's current wish list is a Lockheed Super Constellation and air transports of the 1920s and 1930s.

Even the best collecting plan is useless if there is no place to store newly acquired aircraft until they can be exhibited. The Museum on the Mall in Washington and the Garber Facility in Maryland are filled to capacity. Some of the more recently acquired and durable aircraft are stored outdoors at Dulles International Airport in Virginia. This critical storage shortage has already forced the Museum to decline offers of airplanes that are needed for a balanced collection. We hope that an additional Museum facility can be created in the future so that our collection will not suffer from unnecessary gaps.

*Robert C. Mikesch, Senior Curator,  
Aeronautics Department*

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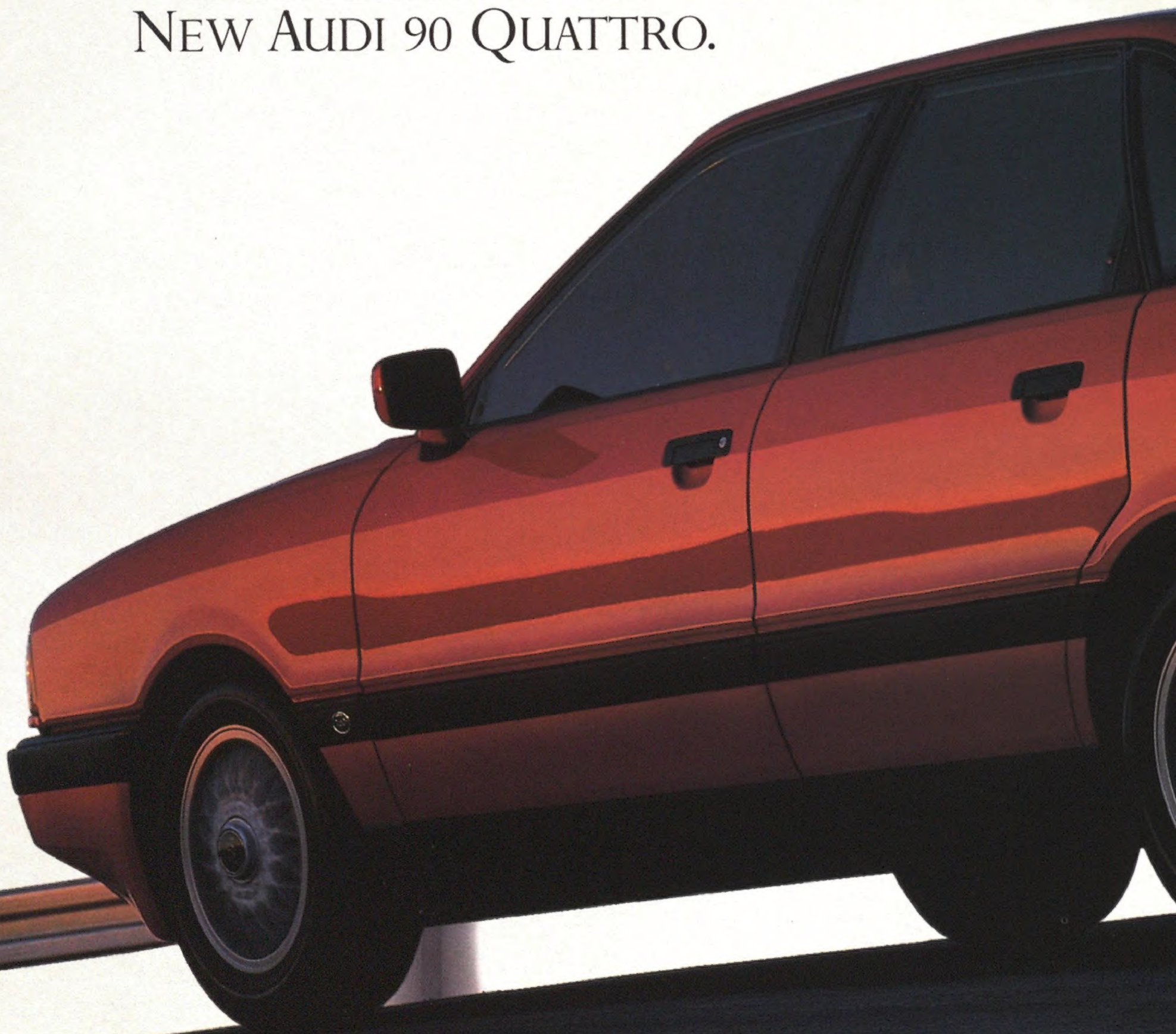
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## Letters

### Identity Crisis

As an aside to William Garvey's "A Case of Identity" (October/November 1987), when the changeover from two- to three-letter airport identifiers was made in the 1940s, I was chief meteorologist for Capital Airlines and a member of the Air Transport Association Meteorological Committee. Many interested organizations worked on this project for several years. Finally, the long awaited location identifier manual was distributed. Everyone was shocked when Canadian officials announced that the identifiers for locations in Canada were completely unacceptable. Thousands of copies of the new publication had to be destroyed.

*Daniel M. O'Keefe*  
Mt. Prospect, Illinois

In his interesting article, William Garvey referred to the airport that was rechristened John F. Kennedy International in 1963, but failed to correct the almost-universal misconception that the airport was previously named Idlewild.

The airport was built on the site of the Idlewild Golf Course in a section of Queens known as Idlewild, but the airport's official name was Major Alexander Anderson Field, after a local military pilot-hero. When the city leased the airport to The Port of New York Authority in 1947, the name mysteriously became New York International Airport.

*Warren H. Goodman*  
Ossining, New York

"A Case of Identity" was a welcome explanation of those often mysterious airport identifiers. In an attempt to modernize train travel, Amtrak has adapted some airline terminology to its needs. "Coach porters" are now "train attendants," and three-letter codes are used to identify destinations. In as many instances as possible, Amtrak adopted the airlines' destination codes, such as LAX, OAK, and DEN. But Amtrak passengers

arrive in New York at NYP or NYG, depending on whether their destination is Penn Station or Grand Central.

*Curtis L. Katz*  
Chicago, Illinois

### Spaced Out

I enjoyed "Space Toys" in the October/November 1987 issue, but must take exception to your characterization of one of the toys. The alien spaceship interceptor pictured on page 96 was created as a tie-in to the television series "UFO," and the initials S.H.A.D.O. refer not to the name of the interceptor but to the Supreme Headquarters, Alien Defense Organization, the command structure organized to fight the invasion.

*Richard Leiby*  
Kutztown, Pennsylvania

As a collector I feel that one of the more interesting items available to collectors was omitted from "Space Toys." I specialize in robots—not Go-Bots or Transformers but beautifully constructed pieces by Japanese manufacturers. These toys are made wonderfully, and their transformations are something of an engineering miracle. But my pride and joy are three models of the Space Cruiser *Yamato* (*Argo* in the U.S.) from the "Starblazers" series.

I encourage the serious collector to seek out old toy shops where folks are steeped in the lore of the Japanese cartoon series that gave rise to most of these robot toys.

*C.R. Berman, Jr.*  
Alexandria, Virginia

### Double Vision

I was intrigued by the photograph of the Blue Angels' F-18s "attempting to merge into an F-36" (Calendar, October/November 1987). What an aviation breakthrough! There would be fewer high-G problems with the F-36—one pilot would be handling the more easily controlled



positive Gs while the other struggled with the negative Gs.

In fact, the only drawback I can see to the F-36 design would be the inevitable arguments as to which of the two pilots would fly the normal heads-up attitude. Should they take turns, or would rank and seniority prevail? The F-36 could give a whole new meaning to the term "Top Gun."

**Michael S. Betts**  
Hyattsville, Maryland

### Picture This

Gary Graf's "Putting Mars on the Map" (October/November 1987) makes for delightful reading. I'd love to see some of those detailed geological maps, especially those of the Valles Marineris region. Can non-scientists get a look at them?

**Margaret S. Hunt**  
Jamaica, New York

*Editor's reply: A list of planetary maps is available from the U.S. Geological Survey. Orders should be submitted to the USGS, Branch Distribution, 1200 South Eads Street, Arlington, VA 22202.*

### A Picture Is Worth \$1,000

Reading the accounts of "Sputnik Remembered" (October/November 1987) jogged my memory of that historic event.

At the time I was assigned to the Air Staff at the Pentagon in the Intelligence Collection Division. Shortly after Sputnik was launched, I was directed to obtain pictures of Sputnik in flight. It was determined that we would find the best opportunity at Thule Air Force Base in Greenland with a 500-inch telescope, then located at Patrick AFB in Florida.

The operations staff immediately obtained a C-124B to transport the telescope and camera from Patrick. The weather was not ideal, and we had only three good nights to photograph Sputnik on its polar orbit.

I was not impressed by the very poor pictures we obtained—especially when I returned to my office to find a \$36,000 bill for the use of the C-124B.

**Ridgely D. Kemp**  
Novato, California

### Oh, Gee

I thoroughly enjoyed Jay Stuller's "High Gs, High Risk" (October/November 1987). The article made complex physiology

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particularly clear. However, in one small, insignificant area the author is wrong. I refer to the statement "A race car driver might routinely experience half a G during turns."

In the 1960s drag racers began routinely exceeding 1 G in the quarter mile. Top drag racers now run the quarter mile in 5.1 seconds with a terminal speed of approximately 280 mph, averaging over 3 Gs. Modern race cars sustain well over 2 Gs lateral acceleration in turns.

*W.F. Miner*

Charleston, South Carolina

### Dance Partners

The Army Reserve flies KC-135s ("Slow Dancing," August/September 1987)? That explains the new camouflaged paint scheme.

*Edward K. Downs*

Sgt., U.S. Air Force Reserve

*Editor's reply: The Air Force Reserve, not the Army Reserve, flies KC-135s. We regret the error.*

### Better Management

I travel over 200,000 miles a year on U.S. airlines and keep pretty good track of reasons for delays. I disagree with Representative Norman Y. Mineta ("Essay: Curing the Air Travel Crunch," October/November 1987) and those who clamor for more money as the solution for airline delays.

Public money will not solve these problems. All the articles I read concentrate on the need for more controllers and more money. Few comment on problems with overcrowded schedules, crews, and maintenance, all of which are caused by airline and airport management.

*A. Michaud*

Philadelphia, Pennsylvania

### Correction

In the October/November 1987 Calendar, Clément Ader's last name was misspelled Adler.

*Air & Space/Smithsonian welcomes comments from its readers. Letters must be signed and may be edited for publication. Address letters to Air & Space/Smithsonian, National Air and Space Museum, Smithsonian Institution, Washington, DC 20560.*



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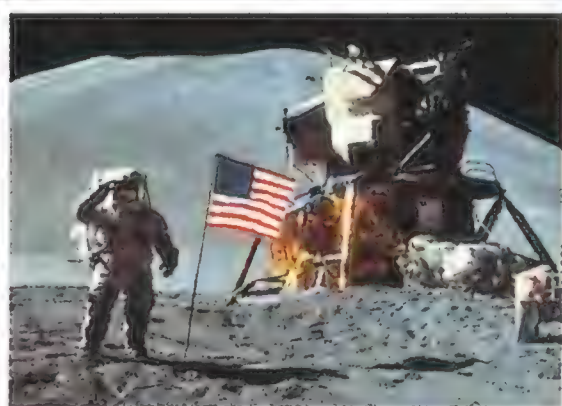
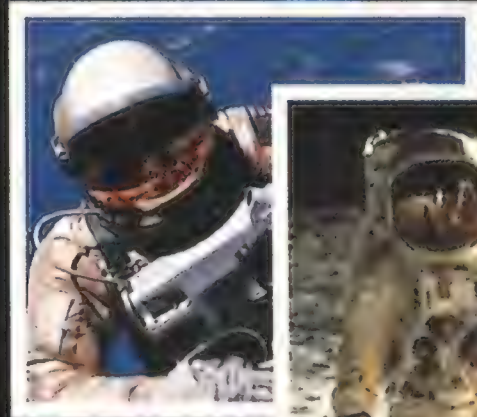
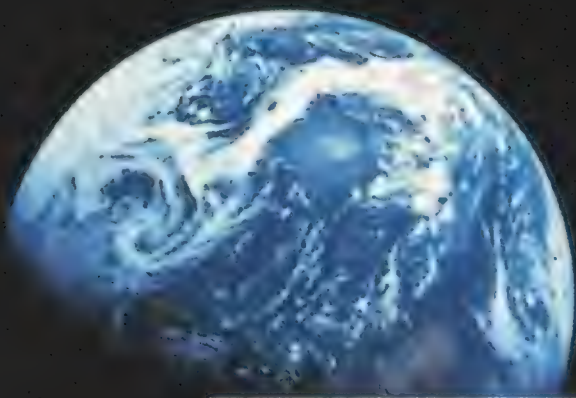
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### A Day at the Races

At Pylon Inner One, the wind sighs through the sagebrush and ruffles the ears of the dogs lying under the folding chairs. The judges fill idle stretches by teasing a reporter who asks what the yellow flowers lining the desert are called. "We trucked 'em all out here just for the races. Tonight we gotta bring 'em all back."

Photographers kick at the sand while their assistants gulp warm soda and long for an ice-cold beer. Everyone stares raptly at the sky, quietly waiting, like the hillside

scene in *Close Encounters of the Third Kind*.

"Gentlemen, you have a race." In his bright yellow P-51 pace airplane overhead, Bob Hoover is the starting gun for the Unlimited Bronze race at Reno, Nevada's National Championship Air Races. The field of thoroughbreds he has herded into formation drops down to 100 feet and bursts into a full gallop around the nine-mile course.

At the course markers judges sit with

pencils poised, ready to penalize those who cut a pylon—descend below it or turn inside of it—during the six-lap race. The airplanes roar past the grandstand and head for Pylon Inner One, still descending—low altitude means less chance of being overtaken from below.

A silver P-51 knifes around the pylon at 50 feet and 300 mph, parting the sagebrush with its wake. On its heels is a P-38, then a P-40, two P-51s, a Yak-11, and a Grumman F8F, engines in full voice, propeller tips

Steve McCracken





exceeding Mach 1 and shattering the air with tiny shock waves. Ten minutes later, a camouflaged P-51 hurtles past the home pylon and the checkered flag and arcs up over the course. The airplanes slow to a canter and are reined in for landing. The pylon judges move back to the shade under an awning on a pickup truck and wait for the next race.

Every third week in September, race pilots bring their highly modified airplanes and a spare engine or two to Reno's Stead Airport to compete in the Kentucky Derby of the air race circuit. Smaller races are held sporadically across the country, but this is the only airport that can accommodate the course requirements of the Unlimiteds—the sleek, souped-up World War II fighters that race in the world's fastest motor sport. They vie for the precious metals of the Bronze, Silver, and Gold races at more than 400 mph for the top prize of \$31,000. More modest purses are set aside for the smaller Biplane, AT-6, and Formula One classes, which race at half the speed of the Unlimiteds.

On Gold Sunday, a good-natured crowd of 50,000 fills the grandstand and roams the pits where the airplanes are stabled. At one end of the field, chili dogs, beer, air race videotapes, and T-shirts are for sale; at the other end, MiG-15s. Between races, Bob Hoover buzzes overhead like a large, persistent gnat in the P-51, a Shrike Commander, or the Sabreliner business jet. (Hoover recently asked the Federal Aviation Administration for a waiver to fly airshows solo in the Sabreliner. He claims the aerobatics make his copilot sick.)

Hoover's friend Chuck Yeager is also on hand, though not to race. When an eager *Reno Gazette-Journal* reporter asks him his opinion of the sport, Yeager growls, "I've flown a few thousand miles per hour—I'm not impressed with speed."

By 4 p.m. the crowd has eaten too many hot dogs and seen enough flying to hold them until next September. Still, there is room for an F-16 demonstration and the standard Air Force narration, which uses terms like "superior maneuverability" and "outstanding acceleration" instead of "gut-wrenching nine-G turns" and "fast as hell."

At 5:15 p.m. the Unlimited Gold entries pose for a group photo in front of the grandstand. This is the Big One. But after the months of preparation, the infusion of dollars and adrenaline, by 5:30 it's all over. Bill Destefani in his P-51 *Strega* sets a new record at 452 mph and beats Rick Brickert's Hawker Sea Fury *Dreadnought* by a nose. Halfway into the race one-third of the field pulls out, overstrained engines dropping from a howl to a mutter as they circle for emergency landings. But they'll

be back. Like Red Sox fans say, there's always next year.

—Patricia Trenner

## Soviet Superpower

Soviet scientists are pondering a construction project that would give new meaning to the term "superpower." The idea is to build huge satellites that harness sunlight for use on Earth. One scheme employs giant mirrors to reflect sunlight onto cities and farms at night. Another uses vast solar-cell arrays that convert collected energy into microwave beams, which are transformed into electricity upon reaching the planet's surface.

Concepts to exploit the sun's energy are older than spaceflight itself, yet they are often dismissed because of their complex logistics. Effective orbiting power stations must be at least hundreds of times larger than any existing satellite, and assembling them would require an armada of rockets to get the components aloft and scores of astronauts to put them together.

It all smacks of Comrade Buck Rogers, but developments in the Soviet Union have made these visions more of a distant reality than pure fantasy. A 1984 article in *Pravda* revealed that scientists were researching how orbiting reflectors could illuminate cities at night and protect crops from frost; according to the story, a 1,200-square-foot test mirror was already in the works. The following year, the Soviets announced a solar power program called Star Electricity. The first major step in implementation came last May 15, when Energiya, the world's largest rocket, was launched from Kazakhstan. Though not yet operational—instead of achieving orbit, the spacecraft mockup it carried got dumped in the Pacific after a propulsion failure—the four-engine rocket with its additional four strap-on boosters can heave at least 100 tons of payload into low Earth orbit. Reminiscent of the Apollo program's legendary Saturn V, Energiya has more than four times the payload capacity of NASA's shuttles.

Aerospace industry analysts in the West initially questioned the need for such a large booster, given the Soviets' existing and projected needs. But Soviet news sources hint with increasing regularity that the rocket's name is indicative of its purpose. After Energiya's first flight, Guri I. Marchuk, head of the Soviet Academy of Sciences, linked the rocket to "the placing of experimental solar power plants in orbit." The timetable calls for lofting enough solar arrays to blanket a small town by the end of the century.

The dream of harnessing sunlight in

NASA



space is all too familiar to Peter Glaser, vice president of Arthur D. Little Inc. in Cambridge, Massachusetts, who originated the concept in 1968. Back then, when most people thought of solar energy only as the source of a great tan, Glaser began mapping out plans for a fleet of "sunsats" that could meet the power demands of the entire United States. NASA began to look into Glaser's plan in 1971, and by 1980 it was the focus of a three-year, \$20 million government study. The plan called for 60 sunsats, each 55 square miles in size and covered with solar cells. Positioned in geosynchronous orbits above huge ground stations that would convert the satellites' microwave beams into electricity, each sunsat was to generate the power of up to ten nuclear power plants.

But interest waned rapidly in 1981, when the National Academy of Sciences estimated that the project would require thousands of shuttle launches over a 50-year span and a total investment of \$3 trillion. Nor were environmentalists thrilled at the prospect of continuous microwave showers from space.

Such drawbacks have not lessened the Soviet Union's interest. When the nation's solar power program was announced two years ago, Soviet scientist Leonid Leskov said that "these space giants will not affect the environment in any major way. Hardly any microwave radiation is absorbed in the atmosphere." And speaking on Soviet space programs in general, geochemist Valeriy



Barsukov of Moscow's Vernadsky Institute recently said that once a program receives government approval, "we have no problems with money." Still, U.S. analysts believe the Soviets might first attempt a simpler and less expensive system of reflectors.

—J. Kelly Beatty

## Over the Hump

On paper, it's a piece of cake, the rough equivalent of flying from Salt Lake City, Utah, to Pueblo, Colorado, in a twin-engine commuter. To ice the cake, remove all navigation equipment, stuff the cabin with cargo, add a few thousand feet to the Rockies, skip the weather briefing and fly into lightning, thunder, and hail at night, and scatter along your route agile fighters hungry for fat, slow prey.

This is what made flying the Hump the stuff of legends. Negotiating the World War II supply route from India over the Himalayas to Allied forces in China conferred on the crews and their lumbering multi-engine transports the qualities usually attributed to fighter pilots in P-38s and P-51s. Remnants of that aura still surround the 5,000 members of the China-Burma-India Hump Pilots Association, 900 of whom came to Scottsdale, Arizona, last September for their 42nd annual reunion.

The bond linking these brethren was forged by beating the odds of a typical Hump run—for example, the 500 miles from Dinjan, in India's Assam Valley, to Kunming, China. From 1942 to 1945, inexperienced pilots and crews in their early 20s coaxed Douglas C-47s and -54s, Curtiss C-46s, and Consolidated C-87s, a transport version of the B-24 bomber, along such routes over the Himalayas, fighting exhaustion, terrain, and some of the world's worst flying weather to deliver 500,000 tons of supplies to China. There were inevitable failures—nearly 1,000 died in crashes of more than 600 aircraft, the wreckage of which dotted what came to be called "the Aluminum Highway." When the Hump Pilots Association was formed in 1945, membership was restricted to pilots who had flown the Hump. Today it includes members of any flight crew with at least one Hump crossing.

On sign-in sheets outside the meeting room, pilots and crews registered by unit and base—Flying Tigers, 308th Bomb Group, Air Transport Command; Chabua, Sookerating, Jorhat. There were fewer sign-ins this year than last. At the business meeting, association chaplain Cookie Byrd read the names of 95 men who lost their fight with time in the past 12 months, interrupted by murmured exclamations and



Steve McCracken

sighs of recognition.

Ernie Chester talked about flying the northern "Married Man's Route," which meant staggering over higher mountains to avoid Japanese fighters flying from southern bases. Bill Kelso recalled minimum ceiling and visibility requirements: "250-foot ceiling; married, add 100 feet; kids, add another 100; if the guy was an administrative type from Operations, make it 10,000 feet and 10 miles visibility."

Robbie Roberts arrived in 1942, which makes him a China Hand. "Back when I was young and stupid, it sounded glamorous to me," he grins. Now in his late 60s, he has stepped down from Hump transports to an Aero Commander Shrike, but he retains an affection for the China he knew 45 years ago.

Both the old and the new Chinas were represented at this year's meeting. Wu Zi Dan, a new life member of the Hump Association, is one of many World War II pilots who remained "on the mainland." Dan, as everyone calls him, came to Scottsdale to encourage Humpsters to visit their old haunts. A handful of pilots from the Chinese Air Force Veterans Association were there to invite Hump crews to Taipei for the dedication of the Chiang Kai-shek memorial. Those who will make the trip look forward to reliving just a little of the year or two that were for many the most exciting of a lifetime.

—Carl A. Posey

## Goin' to the Chapel of Lunch

It's as if the Lawrence Welk show had a layover at Chicago-O'Hare. In the Amelia Earhart Ballroom of the airport's Hilton Hotel, Vlasta the Polka Queen and her Altar Boys swing through their repertoire—from "In the Mood" to Vlasta's own "John Paul II Polka." The crowd of several hundred, mostly senior citizens, eat it up, along with the salad buffet. Urged on by Vlasta, some even hit the dance floor to perform the flapping and pecking Bird Dance. Airport workers drift in to sample the food and dancing before heading back to work.

The occasion is the O'Hare Airport Chapel's Sixth Annual Salad Luncheon, an event organized by Father John Jamnicky, chaplain of the non-denominational chapel. Part fundraiser, part smorgasbord, the August buffet demonstrates how a chapel can act as a hub for an airport community.

"The chapel is the only facility that can bring the whole airport together," says Jamnicky, who moves through the crowd with the ease of an earnest and good-natured politician. A Chicago native, Jamnicky, 42, came to work at the airport six years ago, after a 10-year stint as pastor of St. Martin's Church on the city's South Side.

At O'Hare, Jamnicky has helped the homeless who populate the terminal buildings, lobbied for better travelers' aid, and tried to make the chapel a home to the airport's largely transient population. Jamnicky estimates that 60 percent of the chapel's visitors are travelers, the rest airport workers. "They're not rooted," he says. "They don't tie in to the local churches."

Jamnicky is also busy twisting arms to get the chapel moved from its site in the basement of Terminal 2, halfway down a long, dank corridor filled with damaged luggage. The site, Jamnicky says, often proves too intimidating to jittery travelers. He plans to have Helmut Jahn, architect of United Airlines' radical new O'Hare terminal, design the new chapel.

Each year Jamnicky hosts three major luncheons, which raise part of the chapel's \$100,000 annual budget—the remainder comes largely from donations. Much of the airport community contributed to today's affair: airport shops and catering services provided the food, and airlines donated many of the door prizes. Belgium's Sabena donated a case of beer; Air France a T-shirt ("You can wear this when you go golfing, Sister," Jamnicky tells the nun who wins it). United Airlines supplied the grand prize of two round-trip tickets from Chicago to anywhere in the country. Winner Helen



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An immense Intelsat VI satellite, the world's largest commercial communications satellite, successfully met performance requirements when it was tested for the first time as a complete system. Scheduled to be launched from the European Ariane rocket in 1989, the satellite is the first in a fleet of five satellites being produced for INTELSAT, an international cooperative of 114 member countries. Each of the five satellites can carry 120,000 telephone calls and at least three television channels simultaneously. Intelsat VI, designed and built by Hughes, measures 39 feet high with its antennae fully deployed.

An Advanced Medium-Range Air-to-Air Missile (AMRAAM) sought out and intercepted a selected target in a multi-target air combat environment with the launch aircraft's radar in the track-while-scan mode. The AMRAAM was launched from a U.S. Air Force F-16 at the White Sands Missile Range in New Mexico. AMRAAM is being developed by Hughes for the U.S. Air Force and Navy, and according to the Air Force, AMRAAM's test success rate at this point in development is the highest ever earned by any complex air-to-air missile.

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Prokorny plans to use them to visit her son in Torrance, California.

The salad luncheon marks the fifth time that Vlasta, known in her youth as "the Shirley Temple of Czechoslovakia," has performed at O'Hare chapel events. Her other gigs include TV appearances with Johnny Carson and David Letterman and a role in *Ferris Bueller's Day Off*. According to Vlasta, she and Jamnicky quickly struck a

deal when they met: "If you pray for me, I'll play for you," she told the priest.

Complementing her performance today is gospel singer Ella Jackson, the musical director at St. Martin's. She joins Vlasta for a few numbers, including a duet on a blues song, perhaps the first time that gospel, polka, and the blues have been united. The song? Why, "Sweet Home Chicago," of course.

—Tom Huntington

### Speed-reading

For years highway patrols have taken to the air to catch speeders on the nation's highways. Officers in high-wing single-engine airplanes clock motorists with stopwatches and radio the speeds to cohorts in patrol cars, who intercept and ticket the offenders. "Ten years ago the U.S. Department of Transportation did an extensive study of how aircraft were used by the state patrol in Arizona," says Dick Swier, aviation commander of the Washington State Patrol. "It concluded that aircraft were the most efficient speed enforcement method during daylight hours."

But in Washington the tactic's legality has been questioned. In three cases heard early in 1987, Washington district courts ruled that officers had to actually see an infraction they were ticketing for, and thus couldn't rely on help from airborne officers. The speeding tickets for the three plaintiffs were dismissed.

Since then, state prosecutors have petitioned for—and won—a new law that upholds the patrol's enforcement methods. "It says any officer of the law may issue an infraction notice based on the hearsay testimony or evidence from another officer," Swier explains. "But judges may have their own interpretations of this law, like they did with the old one. I don't know whether it will clarify the issue or not."

Last year the patrol's five traffic surveillance aircraft nabbed close to 33,000 speeders, and Swier hopes they'll be allowed to keep up the good work. "We can cover more territory and catch many more highway speeders per traffic hour using airplanes," he says. "From the air you can watch cars two or three miles away and see how they're moving in relation to the rest of the traffic." Type As, take note: there

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are times you don't want to stand out in a crowd.

—Michael Rozek

## Landing Rites

Military teams are loved for their thunderous high-speed passes and old biplanes for their round-engine nostalgia, but when it comes to just plain good looks, no aircraft surpasses the Concorde. That's why Steve Israel wanted one for his airshow.

Had it been the Paris airshow or the Dayton air fair, Israel might have secured an appearance with little more than a phone call. But this was Northeast Flight '87, a small show at Schenectady County Airport in upstate New York. Israel, a retired school teacher who volunteered for the job of airshow program director, knew it would be a challenge to lure a Concorde to the boondocks.

Negotiations with British Airways began two years ago. The company agreed to do a few low passes at the airshow if Israel chartered it for a \$65,000 "Trip to Nowhere," a 90-minute round trip flight

Steve McCracken



over the Bahamas that gives passengers a taste of supersonic speeds. "We put 100 tickets—\$650 each—on sale on a Friday night," Israel says, "and they were gone by Saturday morning."

The next hurdle was accommodating the Concorde at the general aviation airport.

British Airways needed a ground power unit, an air conditioner, a tug, special fueling equipment, and a 17-foot stair for the cabin door. Israel borrowed a tug from Eastern Airlines in Albany and had a fuel tank cleaned, resealed, and filled. An old set of American Airlines stairs was discovered

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on a pickup truck in a back yard. Israel and his crew got the engine running, cleaned up the stairs, and extended them to the required height.

All systems were go. Then, just three weeks before the August 29 show date, British Airways sent Campbell Pritchett to inspect the airfield. The 7,000-foot main runway was long enough for the Concorde, but Pritchett deemed its condition inadequate. Many of the 10- by 20-foot concrete blocks that make up the runway had started to crack at the edges. "On some corners there was a three- by six-inch piece cracked off," explains Pritchett. The Concorde's jet blast, particularly in reverse thrust after touchdown, can dislodge such pieces of concrete, causing damage to the engine and tires.

Pritchett estimated that some 250 corners and edges needed repairs. The county called in the road crews and agreed to spend whatever was needed to bring the runway up to British Airways standards.

There is some disagreement over how much manpower and money it took to do the job. Some say they saw a crew of 50 at work, others say a half-dozen, but Dick Bliss, commissioner of engineering and public works, says the county assigned only four men for one week. One consultant says it had to have cost between \$50,000 and \$100,000. Bliss says it was more like \$3,000.

Regardless of the amount, the crowd of 6,000 that watched the Concorde land thought it was money well spent. So does Israel. But happiest of all is the 109th Tactical Airlift Group of the New York Air National Guard. For years the county had turned a deaf ear to Guard requests to repair the runway. It took the Concorde to pave the way to safer landings for the Guard's C-130 Hercules transports.

—Patrick Huyghe

## A Hop, Skip, and a Jump from Mars

In July 1988 two Soviet explorer spacecraft will head for Phobos, the larger of the two Martian moons, and Western scientists are decidedly envious. Astronomers the world over believe that Phobos, a dark, cratered, and furrowed rock measuring 12 by 17 miles, may be a captured asteroid little altered since its formation in the birth of the solar system. It could contain key information on the birth of the planets.

After a 200-day journey, the first Phobos spacecraft will begin a two-month orbit of Mars, gathering data in preparation for a 1992 mission to the red planet. Soviet scientists are skeptical about the United States' 1976 Viking mission finding that

there is no life on Mars: they feel the landers just didn't dig deep enough.

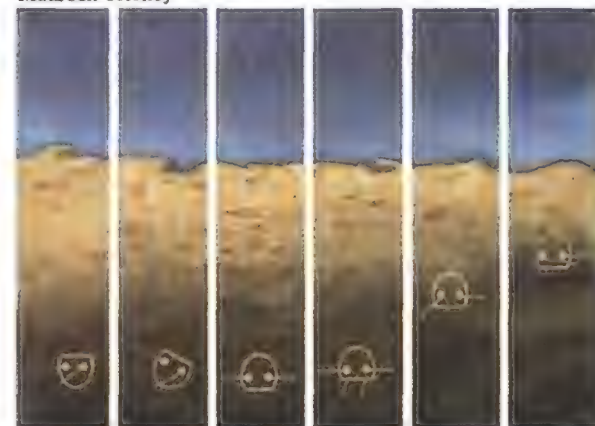
When Mars studies are completed, the spacecraft will blast its way down to within 165 feet of Phobos for 20 minutes of close-up studies. As it hovers over the surface, the craft will take radio soundings of the moon's structure and topography, and zap it with a laser to produce a stream of surface material to be analyzed on board. The spacecraft will drop two small landers loaded with seismic sensors and instruments to take an even closer look at Phobos' chemical, mineral, and magnetic properties. The mother craft will then return to an orbit around Phobos and relay data from the landers to Earth stations.

The 110-pound stationary lander will anchor itself to Phobos with tethers shot into the surface by harpoons and will transmit data for one year. According to Vlatich Slav Linkin of Moscow's Institute for Space Research, the lander will drive a soil probe into the moon, and its TV camera, which can rotate 360 degrees, will provide a remote but panoramic view.

The smaller mobile lander, which resembles a two-legged basketball, is called a hopper but is more accurately described as a flipper. A pair of spheres atop each leg will rotate to propel the hopper by flipping its legs. The lander will make ten 65-foot hops on Phobos, unhampered by gravity: the moon, which orbits within 5,800 miles of Mars, is too small to exert an appreciable pull on the lander.

To ensure a successful mission, the Soviets will launch a backup spacecraft a few days after the first. If the primary orbiter functions properly, the backup will

Maureen Tierney



simply repeat the studies—or it may be sent to Deimos, Mars' smaller moon.

So far, 14 countries have signed up to participate in the Phobos mission, including France, West Germany, Austria, Sweden, and Switzerland. The European Space Agency is looking for a ride to Mars and has indicated it will jump on the Soviet bandwagon if the United States doesn't plan a similar mission. The world's spacefaring nations all want to go to Mars.



Now they have to decide if they should carpool.

—Linda Billings

## No Peeking

Thousands of commuters who take Interstate 5 past Boeing Field on their way to downtown Seattle spotted the odd aircraft hiding among jetliners freshly painted in airline livery. For a day or two, it replaced the Seahawks and the soaps as prime topics of speculation. It looked like a 767, one of Boeing's latest airliners, but it

C. Tolman, Seattle Post-Intelligencer



had a huge welt on the top of the fuselage, as if it had been bitten by a very large mosquito. And stenciled on the aircraft's side was "U.S. ARMY."

Boeing—and the Army—were attempting to keep a low profile on the modified transport, with little success. How do you hide a 50-foot-high aircraft wearing a 70-foot-long cupola?

Boeing Aerospace spokesman William Rice says the Army banned reporters and photographers from Boeing property. It was a futile gesture—the airplane was clearly visible to any tourist and Instamatic on the way to Mount Rainier. A photo of the 767 in flight, tailed by a military chase plane, made the front page of the August 22 *Seattle Post-Intelligencer*. The paper reported that the cupola will house an infrared sensor under development for the Strategic Defense Initiative—SDI to the defense department, Star Wars to the public.

"We haven't granted any photo opportunities for the airplane," Rice says, "and we prefer that the Department of Defense does the talking on SDI. The sensor is still down at Hughes Aircraft in Los Angeles. We're just proving that the modified aircraft is airworthy."

Rice says the modification to the 767 is part of a Boeing SDI program called Airborne Optical Adjunct. It includes a test of an airborne infrared sensing device designed to detect and track incoming warheads, discriminate them from decoys, and relay the tracking data to ground-based



VOYAGER: THE SKIES YIELD Print signed by the artist and co-pilots Jeana Yeager and Dick Rutan

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radar. The sensor, the size of a Toyota Celica and rumored to be sensitive enough to detect the heat of a human at 1,000 miles in the cold vacuum of space, will be mounted on a rail inside the cupola and view its targets through a huge window.

Rice says flight tests will continue into 1989. The 767—the first one Boeing built—has numerous aerodynamic modifications to compensate for the cupola, including bright blue ventral fins under the tail. But no one at Boeing is worried about the aircraft's ability to carry the upper deck addition.

"NASA 905—a modified 747—flies back and forth across the country with the space shuttle bolted on top," Rice says. "It's no big deal. These are sturdy airplanes with big engines." The only problem with the modified 767 is trying to keep an aeronautical secret in a city that knows its airplanes.

—Peter Potterfield

**NASA Rocks in Bangkok**

A night at NASA hardly sounds like a fun evening, but in Bangkok, NASA Spaceadrome is the place to see and be seen. It's the city's newest and hottest discothèque, an upscale hangout rising above bars and roller rinks.

Owner Somchai Sungstittiwong "wanted to change once and for all the negative image of discos," says Sommart Sungstittiwong, Somchai's brother and the

NASA Spaceadrome



manager of NASA. Somchai, previously a gem dealer, orbited London and New York discos in search of a theme and found it in American high tech. "In Bangkok, people just love high tech—anything that's new, rich, and exciting. And we wanted a 'spacey' name, something short, catchy, and easy to remember," Sommart says. It took nearly \$4 million to realize Somchai's vision, designed to attract those who shun

most of Bangkok's bars. "We wanted an up-market night spot that everyone could enjoy, not just the teenagers," says Sommart.

It does have its gimmicks—waitresses in silver dresses with winged shoulders, a glowing 25-foot hexagonal "spacecraft" that descends over the dance floor twice a night—but architect and project director Yodyiam Teptaranon claims that "we are not a toy shop." The attraction seems to be NASA's offbeat elegance, characterized by the midnight blue and stainless steel decor, seven levels of bars and platforms overlooking the dance floor, hydraulic columns with banks of flashing lights that glide up and down, and screens showing music videos, cartoons, and sci-fi movie clips.

Every Friday and Saturday night, thousands of revelers pour into NASA for dancing, drinking, and diversion. But not teenagers, Sommart says. "Our clientele is middle-aged—say, somewhere between 20 and 35."

—John Hoskin

**Update**

**Contracts for the National Aerospace Plane** ("Space Plane," August/September 1986) were awarded early in October to McDonnell Douglas, Rockwell International, and General Dynamics for airframe development. Pratt & Whitney and the Rocketdyne Division of Rockwell won contracts for propulsion development in August. The first flight of the X-30 is scheduled for 1993.

**The Aviation Trust Fund** ("Curing the Air Travel Crunch," October/November 1987) will remain part and parcel of the federal budget as a result of a Congressional vote on October 1. The amendment to free up the funds earmarked for airport improvements was defeated by only five votes.

**Piper Aircraft has lowered parts prices** by 40 percent (Soundings, October/November 1987) and aircraft prices by 20 percent. In announcing the reductions, M. Stuart Millar, the company's new owner, said, "I am not in this business to make money. I am in it to build airplanes. General aviation is a higher calling, like the medical profession."

**"Old 36," Provincetown-Boston Airline's vintage DC-3** ("Something Special in the Air," October/November 1986), celebrated its 50th birthday October 25. The Douglas airliner has logged more



Brian Smith



than 90,250 hours and "is still going great," according to chief pilot George Felton. Though PBA shut down its Florida facilities last May and consolidated operations at Hyannis, Massachusetts, most of its DC-3 fleet has been leased to Eastern Air Express and will fly the southern routes for the winter.

**A fragment of Soviet space debris** ("Eyes on the Sky," April/May 1987) landed in an alley in Lakeport, California, in the early hours of October 11. Everett Danforth was in bed when he heard a clatter "like pots and pans falling out of the cupboard." At daybreak, a seven-foot strip of metal was discovered outside his bedroom window. A North American Air Defense Command spokesman reports that the three-pound object is probably a fragment of a Soviet rocket used to launch a satellite. "I'm kicking myself for not taking a picture of it," says Danforth, a 73-year-old former police officer. "I haven't seen so much commotion since I took fire in the Navy."

RCA



**"Which way to the Macy's Thanksgiving parade?"** (Coast Guard surveillance balloon)

—Patricia Trenner

"If a journey around the world changes a person... then a journey 200 times around the world at the speed that a spaceship travels changes a person even more." Joe Allen, astronaut

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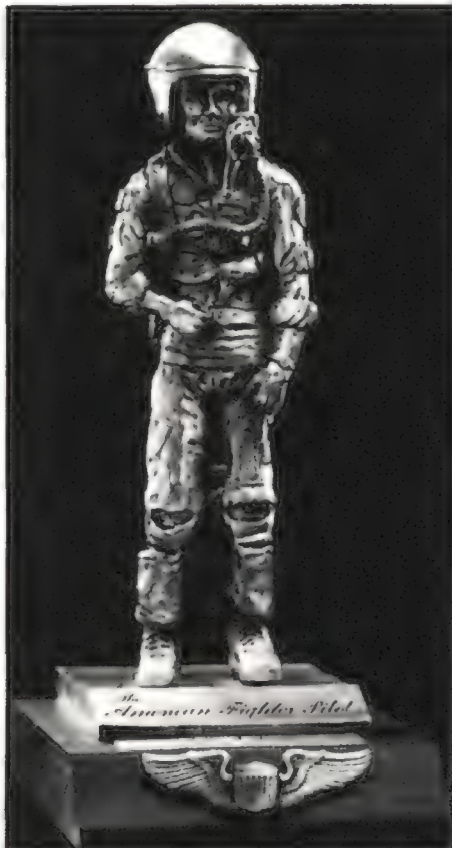
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## Anniversaries...

**1610**

**January 7** Galileo discovers four of Jupiter's 16 moons.

**1758**

**December 25** A farmer and amateur astronomer in Dresden, Germany, is the first to report the 27th documented appearance of the comet later named for Edmund Halley. In 1695 Halley theorized that sightings in 1531, 1607, and 1682 were of the same comet, and predicted its 1758 return.

**1793**

**January 9** Jean Pierre Blanchard makes the first manned balloon flight in the United States. Hoping to realize a windfall, Blanchard charged \$5 per spectator, but to his disappointment gate receipts totaled only \$405. During the 46-minute flight from Philadelphia's Walnut Street Prison to Debtford Township, New Jersey, Blanchard rose to 5,800 feet, carrying a small black dog and orders signed by George Washington. With the president at the liftoff site were political luminaries John Adams, James Monroe, Thomas Jefferson, and James Madison. The orders, the forerunner of today's landing clearances, dictated that Blanchard be allowed "to pass in such direction and to descend in such places as circumstances may render most convenient."

*The press renamed the ? the ! after its successful aerial refueling experiment.*



NASM

**1928**

**January 31** According to a report in *Domestic Air News*, low-flying transport aircraft are disrupting egg laying at the Cackle Corner Poultry Farm in Garrettsville, Ohio. The Postmaster General received a complaint from the owner of Cackle Corner and forwarded the letter to National Air Transport, Inc., a private company operating the New York-Chicago airmail route, suggesting that NAT pilots make a special effort to maintain a decent altitude over Garrettsville.

**1929**

**January 1** Captain Ira Eaker, Major Carl Spaatz, and three crewmen begin a 150-hour endurance flight between San Diego and Los Angeles in an Army Air Corps transport to prove the feasibility of midair refueling. The Fokker trimotor was dubbed *Question Mark*, since no one was quite sure how long it would remain aloft. A supply aircraft provided fuel through a firehose and transferred food and water to the crew. Mrs. Spaatz, watching from San Diego, pointed out the airplane to her daughter Tattie and said, "That's Daddy, dear. Daddy's been up there longer than anybody in the world. Isn't that wonderful?" "No," Tattie replied. "I think it's dumb." Eaker and Spaatz later became key players in establishing the air force as a separate military service.

**1933**

**December 19** Colonel Charles and Mrs. Anne Morrow Lindbergh return to New York after a 29,000-mile survey flight for Pan American Airways. The six-month flight—from Newfoundland to Europe via Greenland, Iceland, Moscow, Africa, and South America—was made in a Lockheed

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*Anne Lindbergh mastered Morse code as a crew member on her husband's flights.*

Sirius on floats. A Greenland youngster named the airplane Tingmissartoq, Eskimo for "one who flies like a big bird." Anne Lindbergh, who often flew with her husband as radio operator, prepared for such trips by immersing herself in Morse code, vacuum-tube technology, and radio communication regulations. In *North to the Orient* she writes about her education: " 'We might as well start with the vacuum tube,' " said our instructor. 'We might as well,' I echoed, as one replies to the dentist's phrase, 'We might as well start on that back wisdom tooth.' "

**1934**

**December 7** Westbound over Oklahoma in the Lockheed Vega *Winnie Mae*, Wiley Post encounters a 200-mph headwind near 50,000 feet, reducing the ground speed of the supercharged Vega to 50 mph. After landing Post wrote, "I am convinced that airplanes can travel at terrific speeds above 30,000 feet by getting into the prevailing wind channel." During World War II, B-17 and B-29 bomber pilots encountered the



same phenomenon at 35,000 feet. Weathermen dubbed this eastbound channel "the jet stream," one of two narrow air currents orbiting each hemisphere at an altitude of 37,000 to 42,000 feet (seven to eight miles). The jet stream averages 35 mph in the summer and 75 mph in the winter, but speeds as high as 200 mph have been recorded.

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*The Hughes Racer was swathed in the same mystique as its pilot, Howard.*

#### 1937

**January 19** Howard Hughes flies the Hughes H-1 Racer from Burbank, California, to Newark, New Jersey, in seven and a half hours at an average speed of 332 mph, setting a cross-country record that stands for 10 years. The magnificent H-1 was flawlessly constructed: once the landing gear was retracted, the gear doors could not be discerned from the rest of the fuselage, so perfect was their fit. The airplane had two interchangeable sets of wings: the long pair, just under 32 feet, was used for distance racing, and the 25-foot set was for closed-course racing.

#### 1945

**January 3 & 4** All Ninth Air Force combat operations in Europe are grounded by bad weather.

#### 1948

**December 17** The Wright *Flyer* is installed in the Smithsonian Institution's National Museum after spending 20 years in London's Science Museum. Orville Wright sent the airplane to England in 1928 after a long dispute with Smithsonian secretary Charles Walcott over who had built the world's first airworthy craft. In 1914 the Smithsonian conducted experiments with the *Aerodrome*, an aircraft built and unsuccessfully flight-tested in 1903 by Walcott's predecessor, Samuel Langley. The *Aerodrome* finally flew, after extensive modification, and was then labeled the "first man-carrying aeroplane capable of sustained free flight." Wright charged that the modifications that enabled the *Aerodrome* to fly had radically

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*Wrighting a wrong: Paul Garber (right) accepts the Flyer for the Smithsonian.*

changed the 1903 design. In 1942 Charles Abbott, Walcott's successor, published a full account of the 1914 *Aerodrome* tests and unequivocally credited the Wrights with the invention of the airplane. Satisfied, Orville wrote to the London Museum in 1943, asking that the aircraft be sent back to the United States after the war ended. Finally, after Orville's death in January 1948, the *Flyer* was returned.

#### 1962

**December 13 & 14** Project Stargazer, directed by J. Allen Hynek (later an advisor to the Air Force's UFO investigation task force), lofts a balloon and gondola carrying Air Force Captain Joseph Kittinger Jr., astronomer William White, and a telescope to 82,000 feet over New Mexico for what was then astronomy's clearest view of the stars.

**December 14** NASA's Mariner II scans Venus from 21,600 miles for 40 minutes and records a surface temperature of 800 degrees Fahrenheit. The probe then entered solar orbit.

#### 1963

**December 17** First Flight Airport is dedicated at Kill Devil Hills, North Carolina. The Federal Aviation Administration, the National Park Service, and the state of North Carolina each contributed \$44,444 to the project.

#### 1965

**December 15** Gemini VII and Gemini VI-A make the first rendezvous in space, maneuvering to within one foot of each other several times during 20 hours of formation flight. Frank Borman and Jim Lovell, aboard Gemini VII, wore NASA's first lightweight spacesuits, which at 16 pounds were less than half the weight of their predecessors. The new suits could be removed in orbit, allowing astronauts to work in shirtsleeves.

*Frank Borman and James Lovell catch a bus to Pad 19 and Gemini VII.*

NASA





**1968**

**December 31** The world's first supersonic transport, the Soviet Tupolev Tu-144, makes its maiden flight. The SST began weekly passenger service within the Soviet Union in 1977, but scheduled operations ended within seven months. The

Sovfoto



*The Soviet SST was a magnificent sculpture but an operational nightmare.*

airplane made lots of noise, burned enormous amounts of fuel, had unreliable engines, and was about as comfortable as a military transport.

**1969**

**December 17** The Air Force terminates Project Blue Book, the last stage of a 21-year study of UFO reports. The Air Force concluded that no UFO it investigated threatened national security, represented an advanced technology, or presented evidence of extraterrestrial origins. (See "When Pilots See UFOs," p. 96.)

**1970**

**December 12** The first U.S. satellite launched by another country departs via Scout rocket from Italy's launch site: the San Marco platform in the Indian Ocean, off the coast of Kenya. The Explorer 42 satellite was also called *Uhuru* (Swahili for "freedom") in honor of the Kenyan Independence Day launch. The Explorer was conducting an X-ray sky survey, which required an exacting equatorial orbit to avoid contamination from the Van Allen radiation belt—hence the launch from the Indian Ocean rather than Florida.

**1978**

**January 24** Cosmos 954, a nuclear-powered Soviet surveillance satellite, burns up as it re-enters the atmosphere and scatters radioactive debris across Canada's Northwest Territories. Operation Morning Light, a mopping-up mission staged by Canadian and U.S. military and scientific forces, lasted eight months and recovered thousands of satellite and uranium particles from a 100,000-square-mile area. Once

Canadian Armed Forces



completed, "the biggest thing you could find—if you worked very hard—was a matchbook cover," said one participant. In 1980, the Soviet Union agreed to pay half of the \$6 million Canada requested as compensation under the articles of the 1972 Convention on International Liability for Damage Caused by Space Objects.

## ... and Events

**Through December 13** "America's Space Truck: The Space Shuttle," Smithsonian Traveling Exhibition. At Children's Museum of Wichita, Wichita, KS, (316) 267-3844, and Rutherford County Arts Council Museum, Forest City, NC, (704) 245-4000.

**December 11–January 3** "Black Wings: The American Black in Aviation," Smithsonian Traveling Exhibition. At Intrepid Sea-Air-Space Museum, New York, NY, (212) 245-2533.

**December 22** Winter begins in the Northern Hemisphere at 4:46 EST on the shortest day of the year, with nine and a half hours of daylight.

**December 31** Move your watch ahead one second on New Year's Eve. To compensate for a slowing of the Earth's rotation, a leap second will be added to 1987. This is the 14th such adjustment since 1972.

**January 2–31** "America's Space Truck: The Space Shuttle," Smithsonian Traveling Exhibition. At Kentucky Highlands Museum, Ashland, KY, (606) 329-8888, and Gallery on the Hill, Long Island Cultural Arts Center at Bald Hill, Farmingville, NY, (516) 924-4344.

**January 14 & 15** Twelfth annual Aerospace Education Symposium. Discussion topics include sailplanes, ultralights, parachuting, lighter-than-air craft, rotary-wing aircraft, and falconry. At U.S. Air Force Academy, Colorado Springs, CO, (303) 370-3075.

**January 23–February 21** "Black Wings: The American Black in Aviation," Smithsonian Traveling Exhibition. At College Center Art Gallery, Middlesex County College, Edison, NJ, (201) 906-2569.

**January 25–27** Conference on Long-Range Mission and Plans for the Civilian Space Program. At Marriott Crystal Gateway, Arlington, VA. American Institute of Aeronautics and Astronautics, (212) 408-9740.

**January 31** "Behind the Scenes at the National Air and Space Museum," lecture by Claudia Oakes. At Tampa Museum of Science and Industry, Tampa, FL. Smithsonian National Associates, (202) 357-1350.

### International Launches

**December** Arianespace, Guiana Space Center, French Guiana: two U.S. and French TV and telecommunications satellites via an Ariane 3 launcher.

**January** Arianespace, French Guiana: European Space Agency weather satellite, West German radio amateur satellite, and U.S. telecommunications satellite via an Ariane 4 launcher.

**January** Cape Canaveral Air Force Station, Florida: classified Air Force payload via Delta launcher.

*Organizations wishing to have events published in Calendar should submit them four months in advance to Calendar, Air & Space/Smithsonian, National Air and Space Museum, Washington, DC 20560. Events will be listed as space allows.*

—Patricia Trenner



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### Celluloid Heroes

The Smithsonian Institution has been collecting films about airplanes almost as long as it has been collecting airplanes themselves. According to Paul Garber, the National Air and Space Museum's Historian Emeritus, the Smithsonian began its aviation documentary collection in 1914 by filming the test flights of the restored version of Samuel Langley's 1903 Aerodrome.

The institution's collection has grown steadily since then and now includes over 6,000 films from various sources, such as NASA, the Air Force, and aerospace companies. The Museum's archives have footage from all periods of air and space history, from 1909 test flights made by Orville Wright at Fort Myer, Virginia, to a 1985 Grumman documentary on the experimental X-29 airplane.

Until 1982, only Museum employees could use the archives, but since then the collections have been open to the public. Researchers aren't allowed to take films from the building, but they can pay to have copies made. Patricia Woodside, the Museum's chief of film and video production and a specialist in archival footage, says her goal is to make the archives into "a supermarket of aviation footage. We're also trying to increase its use as a research tool." While not as busy as a supermarket, the film collections are nonetheless in frequent use. Customers have included all three major television networks, public television, and the National Geographic Society.

Mark Taylor, cataloger and archivist of the collections, notes that some patrons fail to find the films they want. For example, when the Soviet embassy came looking for footage of the Air Force's AWACS radar and communications airplanes, Taylor showed the officials the Museum's complete collection, which consists of less than 20 seconds of material. "They were pretty disappointed," he says.

Other searchers have had better luck. One man was looking for early footage of air crash tests. In an episode of a late 1930s film series called *Wings of the Army*, Taylor found a section on the first

NASM



*Combat America demonstrated that Clark Gable's talents were put to better use in front of the camera.*

*Jack Cohen, the Flying Butcher of Long Beach, proved more adept at filleting than flying.*

air safety experiments, in which technicians at Wright Field in Dayton, Ohio, crashed DH-4 Liberty bombers from World War I.

Occasionally, valuable material is found by serendipity. One afternoon Taylor was reviewing films of German V-2 flights with Assistant Curator Frank Winter. Winter recognized one unlabeled film as the only known footage of Operation Backfire, England's attempt to use captured German scientists to build itself a space program after World War II.

"We thought it was a captured German film dubbed into English," Taylor says, "because the British had the Germans duplicate their experiments *exactly*. The only difference was that the Germans were firing their missiles towards Germany

instead of away from it."

Taylor loves obscure films. His favorite from the Museum collection is *Top Gun*, a 1976 Northrop documentary strikingly similar to the 1986 Paramount Pictures film. Besides the title, both share the same basic plot: the adventures of a group of cadets working their way through the Miramar Naval Air Station's Top Gun training program, from initial briefings through a climactic dogfight. The Northrop film, however, lacking a love interest, manages to tell the story in 12 minutes.

NASM





The connections between the Museum's films and Hollywood predate the '70s. The archives have aviation films produced for the Army Air Corps during World War II with help from Hollywood professionals. *Memphis Belle*, the story of a B-17, was directed by William Wyler, and *Wings for This Man*, a 1944 documentary about black aviators, was narrated by Ronald Reagan.

But the most unusual joint effort is *Combat America*, produced, directed, and written by Clark Gable, in which the actor follows the men of the 351st Bomber Group as they prepare for and complete a mission over Germany. Gable's direction is rather disorganized; for example, he introduces himself to the bomber crew at two points in the film. The shots of the crew at play—lounging in stately ivy-covered houses, passing time in seedy seaside resorts—resemble an expensive home movie. Yet Gable's description of the purposes of U.S. air power still retains its force. "It's thunder out of the Alleghenies, Adolf," Gable says as bombs fall. "You said Americans were soft and decadent—here's a red, white, and blue headache to make you change your mind!"

The Germans, for their part, turned out propaganda films like *Kriegsflieger an der Westfront*, which features vintage footage of Manfred von Richthofen, better known as the Red Baron, and a young Hermann Göring.

Not all of the films in the Museum's archives are about the military. There are many about civilian aircraft, including technical films by the Federal Aviation Administration and the U.S. Air Force's *Aeronautical Oddities in the News*, a 1951 compilation of newsreel footage about unusual aircraft from the 1920s and 1930s. Included is one Jack Cohen, the Flying Butcher of Long Beach, California, who hoped to fly by attaching an engine to a balloon-tire bicycle and wearing bat-like wings. (He failed.)

Perhaps the most poignant moment in the entire collection comes in *We Saw It Happen*, a 1953 documentary produced by United Technologies. The film closes with a sequence featuring General Frank Lahm, who began his career as a student of the Wright brothers in 1907 and later became one of the founders of the U.S. Air Force. We see Lahm, in his 70s at the time, board a commercial flight. In the next scene a stewardess approaches him. "Have you ever flown before?" she asks brightly.

Lahm stares at her. "Yes," he says in a measured, laconic drawl. "I *have* flown before."

*Martin Morse Wooster is an associate editor at The Wilson Quarterly.*

Caroline Sheen



### Back in the USA

Entering the Museum's World War II gallery, a visitor is plunged into a time warp by a wall-size mural. Suddenly it's August 15, 1944. A Messerschmitt and several Focke-Wulf fighters roar through the blue sky 25,000 feet over Germany, trying to shoot down four Boeing B-17 Flying Fortresses that have just bombed a Luftwaffe airfield at Wiesbaden. Snowy white contrails stretch behind the aircraft, providing a contrast to the black puffs of flak that dot the sky. Guns poised and Wright Cyclone engines roaring, the lead airplane, *Thunder Bird*, seems ready to fly out of the wall into three-dimensional reality.

The 75- by 25-foot oil mural, titled "Fortresses Under Fire," was painted by aviation artist Keith Ferris. In 1975, the Museum commissioned Ferris to paint a mural on World War II aerial bombardment. B-17s were to be the subject, but the Museum did not specify any particular craft or mission to be depicted. Says Ferris, "That just wasn't my way of doing things. I like to paint a specific moment in time." So he enlisted the help of aviation historian Jeff Ethell, and they chose the mission Ferris finally portrayed.

Thanks to careful research by Ferris and Ethell, the painting is historically accurate down to the number of bombs—signifying completed missions—painted on *Thunder Bird*'s nose. Ferris chose that particular airplane, a B-17G from the Eighth Air Force's 303rd Bomb Group, as his subject because it was a suitably battle-scarred veteran and because its nose art was tasteful enough for display in the Museum (some World War II bomber crews painted pretty risqué illustrations on their aircraft). Working from slides and photographs, some

Keith Ferris' "Fortresses Under Fire" portrays *Thunder Bird* from a vantage point of 60 feet away.

supplied by a neighbor whose brother had once flown *Thunder Bird*, Ferris painted the mural in 75 days.

That August bombing raid was *Thunder Bird*'s 72nd mission of an eventual 116. In 1945 the airplane was declared war-weary and scrapped. "They made pots and pans out of her," says Ferris.

Last summer *Thunder Bird* returned to the United States—at least in spirit. Another B-17G, bearing the same name and the same red, white, and black artwork on its nose, left England for a new home—the Lone Star Flight Museum in Houston, Texas. The airplane, which had been used by the French government after the war for photo-mapping, had been sold to the Texas museum by a vintage-aircraft dealer in England.

Glenn MacDonald, the Lone Star Museum's director at the time, found the airplane in poor condition when he arrived in England to complete the purchase. Before he flew it back to the States, the aircraft received much-needed repair work—and a new identity. According to present Lone Star director James E. Fausz, the airplane was modeled after *Thunder Bird* for the same reasons Ferris had used it for the mural: the paint scheme and history of the original airplane were both rather dramatic.

Repaired, painted, and newly certified for airworthiness, *Thunder Bird* flew from Duxford, England, to Prestwick, Scotland—which had been the site of an Eighth Air Force base during World War II. From there MacDonald flew to former bomber bases in Iceland and Greenland, as



well as several cities in Canada and the United States. After arriving at Teterboro, New Jersey, *Thunder Bird* made a flight around the Statue of Liberty with Keith Ferris aboard as a passenger. "It was a real thrill because of my association with the airplane," says Ferris.

During the week-long trip from England to Houston, the new *Thunder Bird* proved as trustworthy as the original. "We didn't have any trouble at all," MacDonald says. "It purred like a kitten." *Thunder Bird* had made it home one more time.

*Diane Tedeschi, Editorial Assistant*

### **The Dream Is Alive and Growing Up**

The spacecraft, missiles, and rockets in the Museum's Space Hall, as well as the missions they represent, are the end results of the long, grueling process of scientific research. One night last fall the beginning of the process was on display. Ten national finalists in a student space science competition, sponsored by the

National Science Teachers Association (NSTA) and NASA, talked to Museum guests about the genesis of the experiments that had won them their trip to Washington. Three of the 10, selected by a panel of four professional scientists and educators, would later receive scholarships and computers.

The students were welcomed by the sponsors of the NSTA/NASA Space Science Student Involvement Program. They were also addressed by astronaut Jon McBride, who operated the camera for most of the IMAX film *The Dream Is Alive*, and by television's *20/20* host Hugh Downs. Downs claimed that he envied the young finalists because they would not merely see the remarkable changes that would take place in their lifetimes, they would help make them. The students did not seem intimidated by that prophecy.

The finalists then watched a special screening of *The Dream Is Alive* in the Museum's Langley Theater. Of particular interest to them was a scene in which shuttle astronauts examine a glass case filled with a colony of bees—part of a winning experiment from a previous

student competition.

After the film the students chatted with Washington officials, educators, and others about the implications of their experiments. Representing biology, chemistry, physics, medicine, and engineering, the experiments demonstrated the range of the rubric "space science." Some students were inspired by their home states: a high school senior from Florida proposed studying barnacle formation in zero G; a junior from Alaska wanted to freeze tool steel to make it more wear-resistant.

Amy Bryan, of Shawnee Mission, Kansas, the one girl among the finalists, proposed sending oysters to the space station and using any pearls produced to study decalcification. She wasn't sure that the oysters would make pearls, but she realized that not every experiment works. "That's why they call them experiments," she said. She was grateful to her teacher for requiring the students in his honors biology class to write the proposals. "At first I didn't want to do it," she admitted. "I thought, *This isn't going anywhere*. But now I'm glad Mr. Bingham made me write the paper," she said, smiling at Mr.

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Bingham and surrounded by the artifacts in Space Hall—the Space Station Orbital Workshop, the V-2 rocket, the Apollo-Soyuz command and docking modules. “People have to try things.”

*Linda Blanken, Senior Editor*

## Museum Calendar

Except where noted, no tickets or reservations are required. Call Smithsonian Information at (202) 357-2700 for details.

**December 4** “Aerial Pursuits” Film Series: *Top Gun*. Langley Theater, 7:30 p.m. Admission \$1.

**December 5** Monthly Sky Lecture: “Supernova!” David DeVorkin, NASM curator, history of astronomy. Albert Einstein Planetarium, 9:30 a.m.

**December 10** Lecture: “Voyage to Venus: The Mission of Mariner 2.” Carl Sagan, Cornell University. Langley Theater, 8:00 p.m.

**December 11** Symposium: “Toward a Venus Encounter, 1962: The Organization and Execution of Mankind’s First Mission to Another Planet.” Albert Einstein Planetarium, 2–4 p.m.

**December 12** Planet Lecture: “History of Mars Exploration.” Joseph Boyce, Planet Geosciences Program, NASA. Albert Einstein Planetarium, 9:30 a.m.

**December 17** General Electric Aviation Lecture: “Development of Tactical Air Power, 1914–1945.” Air Vice Marshall Ronald Dick, Royal Air Force. Langley Theater, 7:30 p.m.

**December 18** Exhibit opening: “U.S. Customs Service: the War Against Drugs.” Hall of Air Transportation.

**January 9** Monthly Sky Lecture: “How Astronomical Discoveries Come About.” Martin Harwit, director, NASM. Albert Einstein Planetarium, 9:30 a.m.

**January 14** General Electric Aviation Lecture: “The B-1B.” Major General Albert E. Harbour, U.S. Air Force, Deputy Commander for B-1B Aeronautical Systems Division. Langley Theater, 7:30 p.m.

**January 28** Wernher von Braun Memorial Lecture: General Samuel C. Phillips, U.S. Air Force (Ret.). Langley Theater, 8:00 p.m.



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## Escape and Rescue

If you're an old-time user of the airlines, you carefully ignore the floorshow that the cabin crew puts on before takeoff. You bury your head in *USA Today* while the voice that sounds like a recording talks about how to fasten a seat belt, about oxygen masks fluttering down, about getting your own on quickly (and God help your kid), about seat cushions becoming life preservers "in the unlikely event of a forced landing at sea" (hey, you're on a flight between Dallas and Albuquerque).

Your lack of attention is a matter of caste. You are a veteran, and the rest of the world needs to know it. Besides, arranging air travel is so exhausting that once aboard, the last thing you're interested in is leaving the airplane. And now your cabin crew is telling you how to slide down some plastic chute onto the ground that you have been so painfully involved in trying to leave? Forget it.

The last time I exercised my right to this indifference, I had a wry flashback to days when getting out of a crippled warplane over New Guinea was a thought that often occurred among the night terrors. I knew how to go about it, all right: unclip lines and hoses, pull red handle so canopy flies off, roll upside down, drop out, count "a-thousand-and-one, a-thousand-and-two, a-thousand-and-three," pull D-ring, cross legs

before landing in trees, hide chute from enemy, light cigarette to calm down.

For those cases in which you survived these emergency procedures, your flight instructors had also taught you communications skills. In order to ask directions in the jungle, you learned Pidgin English. Your vocabulary included a few basic survival terms, such as the word for piano: "big fella bokis e got teeth you bangem e sing." Upon finding a friendly Papuan, you were to give him a burst of your best Pidgin English: "Me number-one man b'long lik-lik balus. Balus b'long mefeller, e buggerup finish."

The spelling is only approximate, but the meaning was supposedly clear: you were the captain of a little bird, and your bird had suffered a catastrophic mishap. Your friendly Papuan would then surely react with concern and sympathy.

You would then tell him that you wanted to be taken to the Australian troops ("man b'long Sydney"), to be given food ("kai-kai"), maybe even milk ("sou-sou b'long bullamacow"), and to be kept away from the enemy ("Japan e no good"). You would stand for no nonsense: "You gaminem mefeller, plenty trouble e come behind!" In no time you'd be whisked back to your squadron to strike another blow for Truth, Justice, and the American Way.

This procedure actually worked once for a friend I shall call Addison. After bailing out and getting picked up by friendly natives, he tried out his Pidgin, which, he reported, doubled them up with giggles. Although unhurt, he was carried on a litter for 10 days and stuffed with mouth-watering roast pork.

At last he was ceremoniously handed over to some Australian commandos, who expected him to hike the few miles to our base. He explained that pilots don't march, but they just looked at him, a little coolly, he thought, and started off. After desperately glancing around for his litter, he took off after them. At the end, despite his blisters, he looked wonderful. He'd gained 10 pounds. We greeted him joyfully and paraded him into the mess tent for a banquet of weevilly crackers and mildewed bully beef.

Addison's was a textbook case. Mostly, escape and rescue were rife with glitches.

1: The canopy might stick. They said that if you had a bubble canopy, you should undo your straps and bang the stick forward and you'd never feel the plexiglass as you shot through.

2: You might uncouple your parachute along with everything else. Or it might be packed with a *New York Times* Sunday edition from November 1938. I don't know if those things ever happened. It would be hard to find out.

3: No one wanted to leave the airplane until the last moment. The search-and-rescue plans were always too grandiose to inspire confidence that you'd get back.

So back in the '40s, when you got briefed on tomorrow's rescue procedure—a PBY flying boat to snap you out of the water, a submarine to pluck you off the beach, a commando unit to untangle you from the trees—you'd open a ragged copy of *Collier's* and become ostentatiously absorbed in it.

Or, while the briefing droned on, you might stare at your hand of solitaire and think about maybe someday flying in a civilian airliner, where they wouldn't carry on this nonsense.

—Edwards Park

Phil Jordan





## **THE SPACE STATION: WHAT WILL IT DO FOR US ON EARTH?**

For more than three decades mankind has explored the mysteries of the universe from a vantage point in space. Now we're turning space into a practical place to work.

By the mid-1990s NASA's Space Station is scheduled to give science a permanent platform in orbit. A place where researchers can examine our world from a unique perspective and experiment under conditions of extreme temperature and weightlessness.

In zero gravity, compounds can react in ways not possible here on Earth. Scientists can create better medicines, more-durable plastics, and stronger alloys made of metals that resist mixing under gravity's pull. The Space Station also will give

astronomers a manned observatory for long-term studies of the universe, while Earth scientists will gain a facility from which to better understand our planet.

There are currently four major work packages in the Space Station's development. Lockheed is a key member of three. These packages are to become the foundation of a permanent presence in orbit that promises dramatic advances in our understanding of space and its usefulness to people on Earth. Drawing on decades of experience in countless areas of space science and technology, Lockheed is helping give mankind an invaluable tool with which to master this new frontier.



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## Ski Lift

The little orange and blue Aeronca looked somehow incomplete. Like the cars you see resting on cinder blocks next to malfunctioning refrigerators in rural front yards, the Aeronca was missing its wheels. The airplane's stubby axles and tiny brake shoes sat naked at the ends of the gear struts.

Well, not quite naked. Attached to the axles and half-hidden in the snow were aluminum skis. Yes, I know: if God had wanted airplanes to use metal boards as landing gear, He'd have made runways of snow. But that's exactly what He does each winter on every open meadow and frozen lake in the Adirondack Mountains of upstate New York, and it enables local pilots to experience one of the most delightful yet least known types of flying.

Jim Catalano invited me to Wilmington to sample it with him. A 38-year-old printmaker and art school teacher who lives nearly in the shadow of Whiteface Mountain, Catalano flies from his own airstrip: briefly a bog in the spring but grass in summer and fall and smooth snow all winter. His fleet includes a Piper J-3 Cub and the Aeronca Defender, an early Army Air Forces version of the ubiquitous post-World War II Aeronca Champion.

Catalano and his cat live in a wood-heated barn that he humidifies by hosing down his car in the basement. Though he ends up splattering a spare set of Aeronca wings and a workbench stocked with parts for old airplanes and Lotus sports cars, he points out that "you sleep a lot better and the car gets clean."

Muffled in long johns, insulated boots, ski hats, and gloves, we rock the Aeronca loose—the skis freeze to the snow if you leave the airplane sitting awhile—and wait for the engine to stop stuttering at such a cold awakening. Today's engines require preheating and prayers, but this stone-simple 1940s Continental cooperates under even the most extreme conditions, and we're off into the crisp mountain air.

The Aeronca's skis are merely small aluminum toboggans in place of each main wheel and a tiny homemade ski on the tailwheel strut. Catalano complains that

yuppie acquisitiveness is infecting even the world of ski-flying. "The little Champs and Cubs are so quiet you can hardly hear them coming, but a lot of people here have gotten big Cessna 180s on expensive hydraulic skis that retract partially. They can leave the wheels on and still use regular runways. Those airplanes are so loud they're spoiling it for the rest of us."

Sitting up front—I've been granted the guest pilot's seat because it's closer to the engine and thus warmer—I point accusingly to the airspeed indicator, which reads zero. The flapper valve on the pitot tube has apparently frozen shut. "Aw, you caught me," Catalano laughs. "Flying without a functioning airspeed indicator—it's illegal, but oil pressure is the only instrument I look at anyway." The sound of the slipstream, the attitude of the nose, and the pressure of the controls are sufficient indicators of the Aeronca's vital statistics.

Stephen Beshara/SRW



Soon, slight suction nudges the indicator counterclockwise. It says we are doing 200 mph. "Oh, good. It's working again," Catalano says, knowing his airplane could barely achieve half that speed in a screaming dive.

The summit of Whiteface is hoary with storm-blown snow in its high pines. Vermont's Mount Mansfield, a good 50 miles to the east, gleams rosily in the weak afternoon sun. Below, the land is brilliant and bare, the trees leafless, the underbrush buried. Even the smallest animal tracks stand out like etchings. We can skim the tops of the trees, for unlike airplanes with standard landing gear, vulnerable without a runway below, a ski-plane is equally at home in the snow and the frigid sky. We can—and do—land virtually anywhere.

"When I started flying on skis," Catalano says, "I asked a local bush pilot if there was anything special I should know, and he said no, just tell somebody where you're going. But I noticed he had a pair of snowshoes strapped to the wing struts and a shotgun, axe, and shovel in the back of his airplane. You can go off exploring frozen lakes and suddenly realize you're 50 miles from civilization, like snowmobilers who run out of gas miles from nowhere and only then realize that they're too far to walk back."

How do you tell if a lake is frozen enough to land on? "You see all the ice fishermen out there with their trucks," Catalano jokes. "Actually, it's just experience: knowing which lakes freeze first, where there's a current that'll keep ice from fully forming. One trick is to land hot, take off immediately, and then fly over your tracks to see if there's any water in them."

Catalano points to an inlet below as we putter over Saranac Lake. "A Cessna 140 went through the ice last winter, but he had no business being there. See how the ice is darker where the current flows out?"

We head for a more secure landing site. "Here, you take it," Catalano says. "Put us on the lake down near the other end."

Carburetor heat on, power back, a whistle through the struts that sounds like a comfortable approach—that's the landing checklist for a 1943 Aeronca—and we're





skimming the lake past open-mouthed fishermen. The skis kiss the snow, but I'm too fast and we're back in the air. "Push the stick forward next time you touch," Catalano counsels. Now we're down—just a soft hiss that's felt more than heard. "Push it forward more to slow down—it puts more pressure on the skis." We get out and stamp around in the snow, just absorbing the strange sensation of being suspended above a depthless black.

Ski-flying is a communal activity in the Adirondacks, and soon we're buzzed by a Cub. It's one of Catalano's friends, a Plattsburgh dentist, who invites us on a circuit of lakes. At one stop, he teases a group of fishermen stamping and slapping as they peer into a hole in the ice, a small pile of stiff perch nearby. "Oh, I see," he says. "You just drive around the lake looking for these piles of fish, and then you stop and make a hole. Doesn't seem so hard."

Though it may annoy patient fisherman,

skis and snow may be the ideal interface between airplane and earth. Landing on tires is a comparatively delicate act that demands adherence to the straight-and-narrow of the airstrip. Frozen lakes are a lot wider (and usually longer) than runways. And with wheels, spongy tires arguing with unyielding concrete sometimes makes the airplane pogo along, the old joke being that you're allowed to log four landings for each arrival.

Snow landings are subtle. "If you fly right after a big snow, you literally can't tell when you've touched down," Catalano says. "You look out and your skis are making rooster tails in the snow, and that's the first you know you're down." An old bush pilot trick is to carry boughs of spruce to drop during the first pass over a landing site so that your depth perception has something to home in on. In fresh powder, sometimes the biggest danger is the first step out of the cockpit. Pilots have disappeared up to their armpits in drifts that were substantial

enough to support a ski-footed Cub.

Wouldn't seaplanes offer the same go-anywhere advantages as ski-planes? Not really. For one thing, seaplanes turn into clumsy, drifting boats after touchdown, while ski-planes at least stop. For another, water seems harder than concrete when you hit it at 60 mph, and it's rarely as smooth. Even more of a hazard are barely submerged logs and other surprises that make landing on uncharted waters vastly more risky than skiing onto a frozen lake. "If there are any dangers in ski flying," says Catalano, "they're all right out in front of you, not hidden underwater."

Besides the logistics, ski-flying offers another advantage. "The best thing is that skis give me so much more mobility," Catalano explains. "I can fly across Lake Champlain in 20 minutes, land on the ice off Burlington, and walk into town and buy a dozen bagels. It's more than a two-hour drive by car."

—Stephan Wilkinson



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# *Destination Schiphol*

The aviation heritage of the Netherlands includes Anthony Fokker, KLM—and one of the world's premier airports.

by Ian Keown

*Photographs by Ruud Taal/Capital Press*

Flying into Amsterdam, passing over the dunes separating the Netherlands from the North Sea, a traveler may not appreciate the sheer size of the city's Schiphol Airport. A visit to the control tower provides a better perspective. From its lofty perch, you can see the usual fixtures of a modern jetport—runways, a large terminal building, parking lots—and some surprises: six farms, an aircraft factory, and an aviation museum.

With 4,250 acres, Schiphol is Europe's second largest airport, and in international passenger departures it ranks sixth in the world. Even the busier airports at Chicago and Los Angeles, whose total traffic counts are higher, can't claim as many border crossers.

Even more surprising is the fact that the site of this modern jetport used to be

a lake. Named Haarlemmermeer, the expanse of windswept water a few miles from the North Sea was once the scene of a naval battle, an inconclusive tussle between Dutch and Spanish ships in 1573. The Spanish were eventually ousted from the area, but the menace of fearsome storms remained; the passage through the northeast corner of the lake proved so treacherous to vessels that it was widely known as Schips' Hol, or ship's hell.

In 1848 the Dutch began a four-year process to dam and drain Haarlemmermeer, which ended up polderland, like so much of present-day Netherlands. In

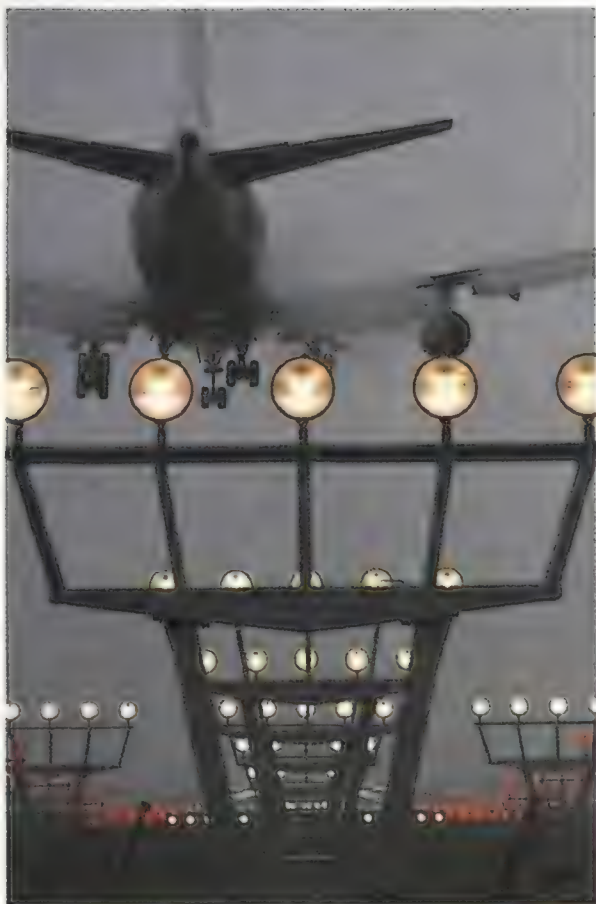
*Not all roads lead to Schiphol airport, but sometimes it seems the airport leads to all roads.*











*For many arrivals the trip is just beginning. One-third of Schiphol's passengers are transfers.*

*Water once covered the airport's site, but what used to be a ship's hell has become an airplane's haven.*

In 1916 a military airfield named Fort Schiphol was built on a corner of the polder next to a canal on which barges glided by 13 feet *above* the airplanes on the field.

Unlike other pioneering airfields, such as London's Croydon and Paris' Le Bourget, which have been replaced by new facilities, Schiphol is still going strong. The original 190-acre aerodrome, now known as Schiphol Oost, or Schiphol East, forms the jetport's northeastern corner, yet it is a sizeable airport with its own identity. Its twin runways handle more than 33,000 takeoffs and landings a year—mostly private and corporate aircraft, an arrangement many airline captains welcome because it diverts traffic from Schiphol's four main runways.

KLM Royal Dutch Airlines, the oldest international airline flying under its original name, provides another link to



the past by maintaining its home base at Schiphol. Albert Plesman had started the airline in 1919, prompted by the success of the Netherlands' first aviation exhibition, which he helped organize. Plesman's idea was to operate passenger service on a scheduled basis, just like steamer and ferryboat lines. With Queen Wilhelmina's blessing, he called the company *Koninklijke Luchtvaart Maatschappij*, Royal Aviation Company. The first KLM flight, from Croydon to Schiphol on May 17, 1920, initiated one of the earliest regularly scheduled air services, which today continues as the oldest such service still operated by its originator.

During World War II Schiphol suffered plenty of punishment from Allied bombing and sabotage by German forces retreating from the Netherlands. After the war the airport was repaired. Old runways were extended and new

ones constructed. In 1958 the city of Amsterdam ceded control of the airport to N.V. Luchthaven Schiphol, a company that started an ambitious expansion program to make Schiphol the gateway not just to Holland but to all of Europe.

There's still some question as to why the Netherlands, a nation that is one-third the size of New York State and has less than 15,000,000 people, needs such a large airport. Neelie Smit-Kroes, minister of transport and public works, credits Holland's centuries-old seafaring tradition. "It was the Dutch, after all, who dispatched Henry Hudson on the voyage that led to the founding of New Amsterdam," she says. "Tasmania is named for a Dutch navigator, Abel Tasman. Rotterdam is now the largest port in the world. Since we have few natural resources, we have had to invent them, so commerce—or trading or





transportation, call it what you will—has become Holland's *métier*.

"We could not fall back on a captive national market," says Smit-Kroes, "so we had to attract air travelers from all over the globe by making Schiphol a most efficient, most convenient, and—how shall I say it—the most *human* transfer airport in the world. We established the value of the hub concept a few decades earlier than American airlines. Now Schiphol itself has become a natural resource—but one that makes a handsome profit."

A tour of this natural resource, along the 40 miles of road that circumnavigate it, should begin at Schiphol Oost. From here, the helicopters of KLM Helikopter N.V. leave to service North Sea oil rigs, and passengers entering the terminal are confronted not by stacks of luggage but by *dompelpakken*, bright orange survival suits worn by

passengers bound for the rigs.

Leaving Schiphol Oost, a traveler will pass hangars that service the aircraft of the six airlines based at the airport. Further along is a hangar that seems to exist in a time warp: standing outside it is a gleaming DC-3 Dakota. The twin-engine airplane is flown by enthusiasts of the 1,800-member Dutch Dakota Association. They pamper the old DC-3, number 19109 and a veteran of the Finnish army.

Past the DC-3 lies the Fokker Aircraft Company factory, descended from Dutchman Anthony Fokker's first factory, founded in 1913. The company's production facilities are at Schiphol Oost, where nearly 6,000 employees are currently putting the finishing touches on the first of a new generation of Fokkers—the Fokker 50 turboprop and the twin-jet Fokker 100. In adjoining hangars, behind secure doors, Fok-

ker technicians assemble and service General Dynamics F-16 fighters. Another group is working on solar arrays and thermal controls for communications satellites and Europe's proposed space shuttle.

Beyond the Fokker factory lies Hoeve Schiphol, one of six farms within the airport perimeter. When the Dutch reclaimed the land from the lake, they designated it as arable, and as the airport encroached on the farms, the farms were simply incorporated into the airport. Today one-third of Schiphol is cultivated by tenant farmers.

It's not easy being an airport farmer. You have to alert the duty officer before operating your tractor, you're not allowed to farm when visibility falls below one kilometer (about two-thirds of a mile), and you can't grow just anything. Plants with seeds that might draw birds are banned, and corn is out because it



grows too tall and might interfere with the instrument landing systems. Schiphol's prime crops are sugar beets, wheat, and potatoes. Hoeve Schiphol is a dairy farm, and it has about half the 275 head of cattle at Schiphol, all of them kept safely inside a corral and nourished by feed grown on the airport.

Despite controls, the farms still attract birds, which constitute a hazard to human fliers. Professional bird patrols

tour the airport several times a day to plot the movements of seagulls and lapwings. To frighten them away, the patrols sometimes play tapes of birds calling out in alarm.

But it's weather, not birds, that causes the most serious problems for crews flying into Schiphol. Fog is the most common nuisance, but the airport has closed only once due to weather: snowstorms shut it down for 90 minutes

in 1979. "Individual captains may opt to divert, but the airport is always open," says Engbert Hofstee, the Dutch government's chief of aeronautical meteorology, who is based at Schiphol.

The frequent fogs have motivated authorities to equip Schiphol with the most advanced navigation aids for automatic landings. Twenty years ago the airport helped introduce automation into air traffic control, and today all the main



*In a nod to local history, a depiction of a 1573 battle on Haarlemmermeer graces a terminal wall.*

*Haarlemmermeer was temporarily recreated in miniature by excavations for a new baggage area.*







J. van Oldenmark/Schiphol

*It takes several police forces to handle security for the 4,250 acres of the airport's facilities.*

*There are six farms at Schiphol. Working the land hasn't changed, but there are unique restrictions.*



J. van Oldenmark/Schiphol

runways are equipped for instrument landing system operation. Airport authorities are also studying plans to equip Schiphol with a microwave landing system, the new standard for jetports. Taxiway lighting is being upgraded. Also in the works are a new system for improved handling of ground movements and a radar system incorporating Doppler techniques to detect turbulence and wind shear.

J. van Oldenmark/Schiphol



*Birds are a hazard for airplanes, so bird patrols work to drive them away from the airport perimeter.*



Three new systems will eliminate some features that were familiar to old-style airports. At some piers the people who guide airplanes to their gates will be replaced by a new visual docking guidance system, which will use ground sensors and video screens to cue pilots pulling in to park. Some fuel trucks are being displaced by hydrants built into the ramp and linked to underground pipelines. Auxiliary power units that

*Amenities like child care centers helped get Schiphol voted best airport by the magazine Business Traveler.*



*Diamonds are popular items at the tax-free shopping center, the largest such airport facility in the world.*

*Travelers like to bring a little bit of Holland home with them. What better souvenir than wooden shoes?*





provide electricity for parked airplanes are being taken off their wheeled carts and put underground as well.

But the new gadget that affects passengers most directly is Schiphol's laser-controlled baggage system. Once it is completed, two miles of conveyor belt will move suitcases to one of 100 holding areas, guided by laser-encoded luggage tags that identify flight number, destination, and class of travel. The sys-

tem will cut down on the number of mislays and reduce flight connection time, already one of the lowest in Europe.

That's to be expected, because Schiphol was designed for transit passengers. One passenger in three is there simply to change airplanes. In fact, travelers often find that the easiest way to England is via Schiphol rather than one of London's airports. The airport's passengers can fly to almost 200

destinations around the world on 68 airlines, including curios like Suckling Airways, which flies to Ipswich, England.

The airport has a number of amenities to keep its passengers comfortable. There is a nursery with baths and beds for babies, a small hotel in the terminal for day or overnight use, showers, hairdressers, atomic-controlled clocks, 1,500 carts for indoor and outdoor use, a Junior Jet lounge for unaccompanied



*Worshippers on the go can visit the airport's chapel, which has Bibles in 25 languages.*



*The airport is an example of the current state of aviation. The Aviodome offers a historic perspective.*

*KLM operates an animal hotel in the freight area, where stewards take care of their four-legged charges.*



children, and a Meditation Room ecumenically outfitted with Bibles in 25 languages and an arrow pointing east toward Mecca.

Downstairs in the trim, sculpture-decorated terminal, an air-conditioned conference complex includes five meeting rooms for groups of 9 to 22 and a press conference room complete with TV lights. Executives can fly in, meet with local associates at the airport, then

fly out the same day without passing through customs or immigration.

Above all, Schiphol is blessed with a great sense of space and a noticeable lack of frenzy. It's an airport designed for 50 percent more passengers than it actually handles each year. It's also virtually an English-speaking airport, which makes it particularly congenial for Americans.

Despite the comforts, some passen-

gers think of Schiphol as a shopping center. The airport mall's 40 tax-free stores have an annual turnover of \$130 million, and shelves at the liquor and tobacco shops have to be restocked 15 times a day. The shops also carry some surprising items: alcohol and perfume are to be expected, but echo sounders, digital glucose monitors, otoscopes, and \$30,000 diamonds are not.

According to Helen Deknatel, man-

*Schiphol is virtually an English-speaking airport, but the terminal's tulips are unmistakably Dutch.*

*The Soviets' Aeroflot is just one of the 68 airlines connecting Schiphol to nearly 200 destinations.*







J. van Oldenmark/Schiphol

ager of Shopping Centre Affairs, electronic equipment is popular with travelers from developing countries, who often can't buy it at home. People from countries with high inflation, like Israel, purchase medical equipment. Americans are big on diamonds because unmounted stones are allowed into the United States duty-free. "The Japanese love brand names—Burberry, Pringle, and the \$350 crystal decanter of Rémy



*With help from freight specialists, ordinary tropical fish temporarily turn into the flying variety (above).*

*Air transport ensures that chicks won't be chickens when they reach their destination (above left).*



*The tons of freight passing through the airport each year range from soup to nuts—with a stop for fruit.*





*Rigorous maintenance is a sign of Holland's pride in its showcase airport.*

Martin Napoleon brandy," says Deknatel. The biggest ticket items are automobiles, everything from Volkswagens to Mercedes. They're sold at the Shipside showroom, a hundred yards from the terminal, and have been going at the rate of a thousand a year for the past 30 years.

Freight is another money-maker for the airport. Schiphol is the 10th largest freight airport in the world, with 436,000 tons a year crossing its aprons. Over half that total is merely passing through, much of it held in bonded warehouses by U.S. corporations like IBM, Sperry, and Hewlett Packard. Bell Helicopter consolidates spare parts at the airport for quick shipment to users in Europe, Africa, and Pakistan, and many U.S. publishers ship their magazines in bulk to Schiphol, where copies are then addressed and mailed within hours to overseas subscribers.

The business of Schiphol is more than a sideline: the turnover of all 525 companies operating there adds up to one percent of the entire gross national product of the Netherlands.

Dutch authorities plan to keep

Schiphol in the vanguard by investing \$600 million to update the airport for the 21st century. Then, according to forecasters, Schiphol will be handling over 20 million passengers a year but with facilities capable of coping with even greater numbers.

A few sacrifices will be made along the way. One of the farms will donate land for another freight warehouse, and more space will inevitably be turned over for parking. But the airport's aviation museum—the Aviodome—will remain, and visitors entering its geodesic dome will continue to be entranced by its artifacts, from a replica of the Wright Brothers' *Flyer* to a Mercury space capsule, scratched and scarred from its high-temperature dash through the atmosphere. And, of course, early Fokker aircraft are on display, fabric-covered reminders of a local pioneer and an emblem of the Dutch contribution to aviation, a tradition of commerce forged in the past and destined to endure well into the future. ➔

*Hotels on the premises allow travelers to wake up in an airport that doesn't sleep. Thanks to advanced landing and air traffic control technologies, the airport has only had to shut down once because of the weather.*











# SOVIETS BLAZE SKY TRAIL OVER TOP OF WORLD

The first transpolar flight won American hearts and headlines.

by Von Hardesty

Sovfoto



*Joseph Stalin and pilot Valeriy Chkalov saw eye to eye on aerial feats that grabbed world attention.*

Like many 20-year-olds, the Soviet Union in 1937 was anxious to show the world what it could do. Since the 1917 Revolution, the Soviets had been straining toward technological maturity and were now ready to prove their coming of age with a series of aerial spectacles. Over the vast testing ground of Siberia, the Russians had developed the most advanced techniques in the world for cold-weather, long-distance flying. In June 1937, they took the show on the road with an attempt to break the long-distance world record: a flight from Moscow to San Francisco over the North Pole.

It was a dangerous undertaking, even for the most skilled veteran of Arctic flying. Many believed it was impossible.

Weather was the constant threat, but the Soviet pilots had learned that the colder the temperature, the better: at four degrees Fahrenheit or below there was little danger of ice forming on the wings or cockpit. Over the North Pole the magnetic compass is useless, so the navigator had to be skilled in celestial navigation. The wireless was the sole link with home and the distant goal. There were no landing fields below. And even if an emergency landing were possible, rescue probably wasn't. The newspapers loved it.

Because the adventure was so daring, its chances for success so tenuous, Moscow launched the flight in secrecy. The world didn't find out until 18 hours after takeoff. But on June 18 the story broke, and the front-page fun began.

TAKE-OFF FOR LONGEST  
NON-STOP FLIGHT  
EVER ATTEMPTED  
KEPT TOP SECRET

News hounds sniffed a story on June 10, when the state department revealed that it had given permission "for a Soviet aviator to fly over U.S. territory." American newspapers had been speculating about a transpolar attempt ever since the Russians landed four airplanes at the Pole a month before. The state department referred all inquiries to the Soviet embassy, but Moscow was so secretive that the embassy had little more information than the newspapers. Consequently, radio and newspaper reports referred to the big ANT-25 lumbering toward California as "the mystery plane."

By the time Soviet ambassador Alexander Troyanovsky announced its takeoff, "the mystery plane" had passed the icy wasteland of northern Russia, the Barents Sea, Franz Josef Land, and Rudolf Island, and was closing in on the North Pole. Americans had been following the progress of Amelia Earhart's round-the-world attempt, but now they kept their radios tuned for the latest developments in the Soviet Pole vault.

They learned that the famous Sigismund Levanevsky was *not* the pilot of the airplane. Most Westerners in the aviation community expected Levanevsky to be Joseph Stalin's choice





*Emerging exhausted from the ANT-25, Belyakov, Baidukov, and Chkalov had two requests: water, then cognac.*

for the flight. Levanevsky had become popular in the United States when he rescued American hero Jimmy Mattern, who crashed in Siberia during one of his attempts to fly around the world. Instead of Levanevsky, the radio audience heard three unfamiliar Russian names: Valeriy Chkalov, pilot; Georgiy Baidukov, copilot; and Alexander Belyakov, navigator. The same crew had made a 5,800-mile nonstop flight across the Soviet Arctic in 1936, flying from Moscow to remote Udd Island, near Kamchatka. This achievement had earned each man the title "Hero of the Soviet Union," but not the credit for breaking the long-distance record set by French fliers Paul Codos and Maurice Rossi on their 1933 nonstop flight from New York to Syria. The Federation Aeronautique Internationale would be called on to validate the distance of the crew's next flight, now that they had shown their ANT-25 aircraft capable of the transpolar trip to America.

A.N. Tupolev, whose initials gave the ANT-25 its name, created his aircraft especially to break long-distance records. It was a flying fuel tank with long red wings spanning 112 feet. A small observation canopy, enabling the navigator to employ his sextant and sun compass, perched on the gray fuselage.

Stalin had summoned both Levanevsky and Chkalov to the Kremlin in May to discuss the aircraft and plans for the transpolar flight. There, the story goes, Levanevsky argued that his four-engine ANT-6 aircraft was safer than the single-engine ANT-25 that Chkalov proposed to fly. Chkalov admitted that a single-engine airplane had a 100 percent chance of failure, but added that a four-engine aircraft had a 400 percent chance of failure. Chkalov won the day, but his quip was unfortunately prophetic. Two months after Chkalov crossed the Pole safely, Levanevsky's ANT-6 was forced down over the Arctic. The crew was lost, and his craft has never been found (see "Has the Levanevsky Mystery Been Solved?" p. 52).

#### POLAR STORMS MENACE NON-STOP HOP TO U.S., PLANE'S POSITION VAGUE

Once Chkalov and his crew had crossed the Pole and begun their arduous flight southward to North America—over thousands of miles of ice floes, vast stretches of ocean, and the desolate and uninhabited subarctic region—a network of Canadian and American radio stations was supposed to monitor them and, if necessary, assist in case of an emergency. This would have been a good idea if the Russians had spoken English or if the Canadians and Americans had spoken Russian. As it was, the language barrier and



radio malfunctions made tracking the airplane nearly impossible, and many confusing reports of its location and heading were issued. During one 12-hour radio silence, newspaper accounts grew feverish: "Over the uncharted ice wastes the monoplane sped on, while observers attached to three cooperating United States government departments waited anxiously for word. The plane might have passed over mountains, pits of dangerous air currents, or ice-laden seas; it was not known, for none had gone before."

When an American radio station established contact with "the mystery plane" as it passed over Great Bear Lake in



*George Marshall (far right) joined the airmen on parade in Portland, the first of many U.S. cities to cheer them.*

northern Canada, people on the West Coast no longer thought of the flight as a newspaper headline about a distant event; it was suddenly real. Subsequent reports on Saturday, June 19, confirmed that the aircraft had flown westward, crossing to the Pacific Ocean near Sitka, Alaska, and then had headed south for California.

On Saturday evening Soviet officials were in San Francisco making preparations to welcome their comrades to the Oakland airport. Meanwhile, up in Vancouver, Washington, Brigadier General George C. Marshall and his wife Katherine relaxed in their Victorian home overlooking the old Pearson Army airfield and, across the Columbia River, the city of Port-



Leonard Conkling

land. The Marshalls, like countless other families in the Pacific Northwest, spent the evening listening to radio updates of the Soviet polar flight.

They awoke Sunday morning to the news that the Soviets had ended their southward journey. Fog had forced the pilot to turn back north, and the radio reported the aircraft near the mouth of the Columbia River, the border between Washington and Oregon. Soon it became evident that the Russians were following the Portland airport radio beacon in search of a place to land. A crowd quickly gathered at Portland's Swan Island airport, hoping to see the Soviet aircraft touch down.

The weather at Swan Island was poor: low clouds, fog, and light rain. Hundreds were huddled on the wet tarmac watching the overcast sky. At 8:00 a.m., a strange-looking single-engine monoplane with a silver fuselage and huge red wings suddenly dropped out of the clouds. All eyes followed the aircraft as it dropped to about 150 feet and swept the length of the airport . . . then rose again and abruptly veered to the northeast. The Russians were flying toward Vancouver, passing over the Columbia River bridge. They were heading for the old Pearson airfield. Newsmen and onlookers rushed to their cars to race across the river in pursuit.

Corporal Charles Alexander of Company B, Seventh Infantry, was on duty at the guardhouse at the edge of the field, reading a book and listening to the radio. He had heard the Russians were in the area. At the sound of an airplane, he looked up and watched as an unfamiliar aircraft rolled to a stop outside his station. The words *Stalinskiy marshrut* (Stalin route) were emblazoned on the sides of the fuselage. No question. Russians in the area. Another soldier in a nearby hangar alerted the captain of the guard.





Fifteen-year-old Don Carpenter, who lived near Pearson field, had been awakened by a loud noise and, looking from his porch, had seen a red-winged aircraft that looked like a "huge bat." He raced to the field on his bike just as the propeller made its final turn. Behind Carpenter were the first cars from Swan Island.

**FOG ENDS FLIGHT  
580 MILES FROM GOAL,  
HEROES LAND UNHERALDED**

The *Stalinskiy marshrut* had touched down on the rain-soaked grass strip at Pearson at 8:22 a.m., made a slow run to the east end of the field, and coasted to a stop at the very edge, approximately 350 miles short of the 5,657-mile world record held by Codos and Rossi. At that moment, the captain of the guard was interrupting the general's breakfast to tell him that the Russians had landed.

Chkalov was the first to leap from the aircraft. While thousands awaited him at the Oakland, California airport, Chkalov was greeted in Vancouver by a single ROTC student, George Kozmetsky, who, by chance, spoke Russian. Chkalov hadn't slept in 63 hours. He had prepared for the difficulty of trying to communicate with American military personnel. But he was being greeted, excitedly, in Russian.

Baidukov emerged and quickly helped Chkalov explain to the startled Kozmetsky that they were from Moscow and at the end of a flight across the North Pole. Kozmetsky would serve as an interpreter over the next few hours.

General Marshall had told his wife on his way out the door to prepare breakfast for guests. Once he reached the field, Marshall placed guards around the ANT-25 and, with the assis-

*Its giant red wings dominating the airfield, the ANT-25 was protected from the crowd by Army guards.*

tance of Kozmetsky, collected the Soviet fliers for the trip up the hill to his home.

For the next 24 hours, the Marshalls contended with the firestorm of publicity that engulfed the Portland area. *Time* magazine described the transpolar flight of Chkalov as "a gnat buzzing over a man's bald head." President Franklin D. Roosevelt applauded the "skill and daring of the Soviet airmen" who had "so brilliantly carried out this historic feat." Stalin himself sent his greetings to the three heroes, seeing in the transpolar flight a mighty aerial achievement for the Soviet Union.

For a few weeks after their flight, Chkalov and crew were paraded through San Francisco, Washington, and New York and were questioned continually about their Arctic adventure. Chkalov described flying against headwinds and rough weather and revealed that they had nearly run out of oxygen after flying at high altitudes for long periods to avoid storms. Their drinking water froze, and ice formed on the wings. They flew 10 hours through heavy fog, and for 22 straight hours they received no weather forecasts.

Reporters for the local Vancouver paper, the *Columbian*, were enjoying the scoop of a lifetime and were not eager to share the story with their rivals at the Portland *Oregonian*. Under the headline "Russians Know Airports," the *Columbian* reported that the Soviets had landed at the Pearson airfield by choice, not by accident. The article concluded with what might be termed news analysis: "Poor Portland! They died hard over there across the Columbia River. How they did



## Has the Levanovsky Mystery Been Solved?

When the world-famous Soviet pilot Sigismund Levanovsky went down over the Arctic in August 1937, his disappearance unleashed one of the mightiest international search efforts in aviation history. For months, search teams flew over hundreds of thousands of miles, scanning icy seas and the northern wilds of Canada, Alaska, and the Soviet Union. They never found him.

Levanovsky and his crew had crossed the North Pole on a historic flight from Moscow when their last clear radio message was received. Their location was identified as 300 miles south of the Pole, and their course was set for Fairbanks, Alaska. Where they finally landed—or crashed—is still a mystery. But a macabre clue, discovered near the site of a 1967 crash,

was nearing the bottom of the pile, he uncovered a human skeleton.

Pedersen didn't tell his friends about this find, either. "They were already depressed," he explains. But he took pictures of the site so that he would have evidence of his discovery.

That day, after their signal fire had been spotted by a Wien Alaska Airlines F-27, Pedersen and his friends were rescued by a U.S. Air Force helicopter.

"When the helicopter landed, we were so excited about the rescue that I forgot to tell about the casket," Pedersen says. "Then, when we were picking up, I lost things out of my parka—at least two rolls of the black-and-white film."

On the way home, Pedersen tried to find out whose skeleton he had uncovered in the wilderness. "I asked some natives in Old Crow if the Indians would bury a man like

have taken him in the same vicinity where we went down."

Aklavik, in Northwest Territories, was a fuel and maintenance stop well known to Arctic pilots in the 1930s. Used as a base by Sir Hubert Wilkins and many of the other aviators who searched for Levanovsky, the town is approximately 100 miles—across the Richardson Mountains—from the area where Pedersen found the skeleton. Pedersen's theory is that Levanovsky reached the North American coast, then, flying with only three engines, made for the closest airfield he knew—Aklavik. "He may have hit a mountain in the Richardson range," Pedersen ventures, "or landed on the tundra," then moved to a camp in the forest, where, like Pedersen, he would find protection from Arctic storms and plenty of wood for signal fires.

This August, 20 years after his rescue, Pedersen returned to his survival camp. Accompanied by a team of investigators, he went back to survey the camp, to retrieve his lost film, and to re-evaluate his theory. David Norton, the executive secretary of the Arctic Institute of North America and the man who arranged the expedition with support from the University of Alaska, thinks Pedersen may be right. "Einar Pedersen and his two companions were not the only people forced to survive at that spot," he says.

Norton, who is directing an AINA project to solve the Levanovsky mystery, says that the search party did not find the skeleton or the film canisters, but did find evidence of an earlier survival camp: the log pile that Pedersen remembers and a rugged lean-to, which had been covered with snow during Pedersen's 1967 experience.

The researchers, who included Pedersen's son Sverre as well as representatives from the Yukon Science Institute and the Interior and Arctic Alaska Aeronautical Foundation (IAAAF), examined the woodpile and made a quick sweep of the area with metal detectors. They had agreed not to dig into the moss layer, says Norton, or to disturb the site in any other way that might hinder future archeological investigations. They did not dig into the woodpile, therefore, to see if the skeleton was still there. One of the IAAAF expedition pilots found rub marks and brown fur left by a bear.

Trees had been cut as far as 250 yards from the central camp site. The farther the tree stumps were from the center, the taller they were. The higher cuts on the trees indicate that snow accumulated after the first, lower cuts were made.

"They cut down every tree in their field of view exactly the way Einar did," Norton says. "If an airplane came, they would have

NASM



has recently reopened the search.

In the 1960s Norwegian navigator Einar Pedersen pioneered polar and north Canadian routes for the delivery of small aircraft from Alaska to Europe. On October 13, 1967, Pedersen and two pilots crash-landed in a twin-engine Piper Apache on the uninhabited Canadian tundra northeast of Old Crow, in Yukon Territory. They built a small lean-to in a wooded area not far from the base of the Richardson Mountains. While Pedersen was gathering wood for a signal fire, he came across a large pile of cut logs.

"This I didn't tell my friends," Pedersen grins. "I just went to the woodpile whenever it was my turn to keep the fire burning. My right arm was broken and splinted. With only a left hand, it was easier to take wood from this pile than to gather or cut it." On the 10th day, when Pedersen

*What happened to the ANT-6 carrying Sigismund Levanovsky (third from left) and his crew?*

that. But they said no, not like that. When I asked if any people went up there trapping, they said no, people don't go that far up."

Satisfied that no one would set up camp in that part of Yukon Territory by choice, Pedersen wondered if he had found a clue to the Levanovsky mystery. He began studying the circumstances of the Soviet pilot's disappearance and determined that the site of his own 10-day ordeal could have been the location of Levanovsky's last days.

"I don't think Levanovsky went down immediately," Pedersen says. "Even with one engine out, they could have flown for many, many hours. I think he would have tried to land in Aklavik, and that would



known about it."

Scientists at the University of Alaska have examined wood samples that Norton brought back from the site. Although the evidence is not conclusive, tree-ring dating suggests that the trees could have been cut in 1937.

The metal detectors located a brass cartridge that Einar Pedersen had used to shoot small game in 1967. Other signals from objects hidden under the moss may indicate cartridges from the earlier camp, Pedersen believes. He is hoping to uncover them on an expedition planned for next summer.

Some contemporary accounts corroborate Pedersen's theory. Eskimos from Barter Island, off northeast Alaska, reported hearing an airplane overhead the day Levanevsky was due into Fairbanks. They said the sound disappeared toward the southeast. This is the direction of Aklavik.

Other stories support the theory that the aircraft crashed into the sea near Oliktok Point, about 150 miles west of Barter Island. Natives of Oliktok claimed they saw "a plane or large motor boat hit the water two or three times," then disappear beneath the waves. A week later a trader in the area reported the water covered with oil. This August, while Norton's team was surveying the survival camp in the Yukon, Walter Kurilchik, a retired federal appraiser and college instructor from Capistrano Beach, California, was investigating 30 metal objects that had been detected with a magnetometer off the Oliktok coast. Divers were unable to recover any of the objects because they were buried under more than five feet of sand and no dredging equipment was available. Believing the objects are pieces of Levanevsky's airplane, Kurilchik is also planning another expedition next year.

If Kurilchik is right, whose skeleton did Pedersen find? The question may be answered next summer, when archeologists investigate the area. In the meantime, Norton is poring over information—maps based on Sir Hubert Wilkins' search; records from archives, such as the Arctic Institute in Leningrad and the Vilhjamur Stefansson collection at Dartmouth College; and fragments of stories and reported sightings—to find out why, if Levanevsky did crash in the Richardson Mountains, the repeated attempts to find him failed.

For Einar Pedersen, the failure of the search parties is not part of the mystery. "Many search planes flew right over us," he says, "but it is very difficult to see an airplane on the ground. I've been on searches myself, so I know how hard it is."

—Everett A. Long

want that plane to land on Swan Island!"

Journalists from all over the country worked diligently to penetrate the barriers of language and politics for a close look at the personalities of the Soviet heroes. Chkalov, the 33-year-old son of a Volga River boatman, was a veteran test pilot who had joined the Red Air Fleet shortly after the Revolution. He was the unquestioned leader, muscular and gregarious, always quick to smile, noted for his love of cognac and remembered in Vancouver for his largesse with mementos, usually Soviet cigarettes. As a young test pilot, Chkalov had been repeatedly reprimanded for daredevil flying. He was discharged from the air force in 1929 for crashing his fighter while trying to fly under telephone wires but was later reinstated.

Baidukov was three years younger, also of proletarian background and an extrovert, a talented pilot in his own right but more articulate than the rough-hewn Chkalov. Belyakov, who appeared younger than his 40 years, was more circumspect and reticent, the perfectionist, seemingly content to let the other two fliers occupy the spotlight.

#### SOCIALISM BASIC IN FLYERS' FEAT, MOSCOW AVERS

While the American press depicted the explorers as individual personalities, the Soviet press drew them as symbols of Bolshevik spirit. *Pravda* and Radio Moscow trumpeted the transpolar achievement as an example

of the strengths of a socialist society. Airmen were the darlings of Stalin's regime, the embodiment of heroism and of the "New Soviet Man." They normally flew in teams, an expression of the collective spirit of the Revolution. Stalin's Falcons, as his fliers were called, in turn dutifully served the cult of personality: Chkalov, for example, stated that Stalin himself had "suggested" the Arctic route they took in 1936, and for this reason they called their ANT-25 the *Stalin Route*.

Riding on the wave of global publicity, the Soviets launched the second of three transpolar flights in July. One month after Chkalov crossed the Pole, Mikhail Gromov set a new long-distance record with a 6,306-mile nonstop transpolar flight from Moscow to San Jacinto, California. Once again, Americans received the heroic crew with a whirlwind tour. Once again, Soviet propaganda organs claimed the flights were proof of Soviet modernization and of the technological successes made possible by Communism. Charles Lindbergh had praised the achievements of Chkalov and his crew, but, as time passed, claims such as these led him and other knowledgeable observers to view Soviet aviation as a sort of technological Potemkin village, more facade than reality.

#### MORE EXECUTIONS HINTED IN MOSCOW

Aerial achievements were not the only Soviet events making headlines in the summer of 1937. The Soviet Union was being ravaged by Stalinist purges.

Waves of arrests, punctuated by show trials, were among the costs of Stalin's relentless pursuit of industrialization. In 1938 A.N. Tupolev was arrested and imprisoned for five years. Against this grim backdrop, the feats of Chkalov and Gromov seem to have served a darker agenda: to create the illusion in





the Soviet mind that the sacrifices demanded by Stalin were somehow necessary for technological advance. But the high cost of Arctic air exploration was about to become clear.

After the two spectacular successes of Chkalov and Gromov, the Russians went for three. In August 1937, Sigismund Levanevsky crossed the North Pole in his ANT-6 and disappeared. The Levanevsky tragedy led to the end of the great era of Soviet aerial adventures and to the belated recognition that new records established at great expense could be easily broken.

The last Soviet long-distance attempt was made in April 1939 by Vladimir Kokkinaki, a skilled veteran of numerous Arctic flights. Trying a Moscow-New York route over Iceland, Kokkinaki was forced to ditch his modern DB-3 bomber after 20 hours near Miscou Point in New Brunswick, Canada. Kokkinaki's failure revealed that the "route of heroes," as the Soviet press described the flights to North America, was in

fact an aerial gauntlet, fraught with risks and inevitable failures. Chkalov and Gromov were not better pilots than Levanevsky and Kokkinaki, only more favored by weather and circumstance.

#### SOVIETS LEAD WORLD IN AIR EXPLOITS

"For sheer adventure and thrills the Russian Arctic flights easily took first place among all the world's exploits in the air during 1937," exclaimed the 1938 *Aircraft Year Book*, published by the Aeronautical Chamber of Commerce of America. The Soviet transpolar fliers had not only crossed over the roof of the world; they had crossed over a cultural barrier. At a time when American sentiments toward the Soviet Union were mixed, these three men were welcomed as heroes. Yet their fame in the United States proved to be short-lived. For Americans, the names Lindbergh, Earhart, and Post evoke the Golden Age of Flight. Chkalov's name remains well known only in the Soviet Union and in Vancouver, Washington, where his landing is still the source of local pride. ✈

*Mikhail Gromov broke the world distance record with a 6,306-mile flight that ended in a California cow field.*



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# The International Space Year

The task of exploring space has grown too large for one nation to take on alone.

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by Harvey Meyerson  
President, US-ISKY  
Association

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**The ISKY cannot  
succeed on  
scientific  
cooperation  
alone — it must  
involve the  
public.**

Since the launching of Sputnik 30 years ago, space exploration has been a race between the United States and the Soviet Union. The goal is to be first, the buzzword is "leadership," the motivation is national prestige. Americans raced the Soviets to the moon, and now there's talk of racing them to Mars. Will we continue racing them all the way to Pluto and on into the next galaxy? And will we also start racing against other spacefaring countries?

The problem with space programs and policies built upon these premises is that they ignore the boundless nature of the universe. No nation can map its future in space without first recognizing that on the cosmic frontier, international cooperation is a necessity, not an option.

Now a global event is in the works to promote cooperation in space: the International Space Year, scheduled for 1992, the 500th anniversary of Columbus' discovery of America and the 35th anniversary of the International Geophysical Year, which ushered in the Space Age. And the timing of the ISKY couldn't be better.

National prestige was good motivation for our early forays into space: nations wanted to establish themselves as independent spacefaring powers before they would consider cooperation. But today, every major space power is considering a long list of ambitious new projects—space stations, Martian and

lunar bases, star probes—and no nation on this tiny planet can do it alone.

At the same time that nations are asserting their independence in space, they are noticing that a growing number of their space activities are converging with those of foreign counterparts. For instance, the United States and the Soviet Union are planning separate robotic missions to Mars in the 1990s. However, scientists in both nations have discussed the benefits of coordinating their plans and exchanging data. The same thing is happening with robotic lunar exploration missions planned by the United States and Japan.

The purpose of the ISKY is not necessarily to bring peace on Earth or banish nationalism but to encourage cooperation among nations in ways that reflect the unique demands of space exploration. Plans for the ISKY recognize that space defines a part of the identity of our era, as Europe did the Renaissance. And as the Renaissance marked the liberation of individual creative powers, so the Space Age is characterized by new requirements for cooperative activity that invite new kinds of creative thinking.

The international scientific community can serve as a good model for the transition to the Space Age, with its common language, universal goals, comprehensive perspective, and the global networking that worked so well during the International Geophysical Year of



1957-58. Scientists in more than 60 nations worked together during the IGY, coordinated by the International Council of Scientific Unions. ICSU has already taken a major role in planning the ISY by asking member organizations for ISY proposals this year. National space agencies are also involved. Such diverse activities as space science missions, special programs for grade-school science classes, and new projects for the United Nations science and development programs will be coordinated during the ISY. The emphasis will be on coordination rather than management: ISY planners don't want to create a global directorate that would tell nations what they should do in space.

The first ISY planning conference took place last summer, when 150 delegates from eight spacefaring countries and the European Space Agency met in Hawaii. The conferees compiled a list of possible ISY activities that surprised even themselves. Satellites monitoring Earth's atmosphere, oceans, and landmasses collect complementary information, and the conferees proposed closely coordinating these national remote sensing systems to study environmental change. They also proposed creating an International Remote Sensing Council to establish global standards for data collection, global distribution of satellite data, and improved coordination of mission planning. Japanese aerospace industry officials proposed the organization of a global environmental observation system of at least 22 satellites. The system could be modeled after the Intelsat global satellite communications system and could include Earth-observing satellites already planned or in operation.

A thread running through discussion at the conference was the idea of using the ISY to promote greater global standardization of space activities. For instance, to ease space rescues, safety planning for U.S. shuttle and space station missions could be expanded to make communication as well as docking equipment and procedures compatible with those of all other inhabited spacecraft. The conferees also agreed that it doesn't make sense for different countries to start from scratch and independently design extraterrestrial settlements of unprecedented complexity. Instead, a number of internationally coordinated research institutes could be established during the ISY, including a "moon park" on Earth where research would include construction of a simulated lunar base. A program is already planned for the 1990s, independent of the ISY, to use ground-

and space-based observations to study global environmental problems such as ozone depletion and deforestation. The ISY could inaugurate the International Geosphere/Biosphere Program and bring its Space Age message to the public.

But the ISY cannot succeed on scientific cooperation alone—it must involve the public. Indeed, the ISY must differ sharply from the IGY in this crucial aspect. While most scientists who participated in the IGY remember it as a productive and inspirational event, 99 percent of the population are most likely to recall a single IGY project—Sputnik. If a U.S. satellite had been launched first, the result would have been the same. Thus, no matter how many cooperative activities it encompasses, without a public education campaign the ISY won't change old attitudes.

A consensus is developing among the planners to make the ISY a one-year event that will include planning for activities extending over many years, even into the 21st century. But the ISY can't succeed without widespread public support and involvement. There should be programs in elementary and secondary schools that exploit the great appeal of space to stimulate interest in science. Professional societies, public service organizations, and public interest groups should develop adult education programs dedicated to the themes of the ISY.

The ISY must reach beyond the space community to include all interested groups and individuals. The US-ISK Association, formed in 1987 to coordinate public participation in the United States, has already received proposals. An attorney and amateur handyman suggested a worldwide student information exchange program, in which cheap, standardized homemade telescopes could be used to collect the data to be swapped. A national engineering association offered a plan for international teleconferences on space topics. A public television series on the ISY is in the works. The IMAX Corporation, producer of the big-screen film *The Dream Is Alive*, is planning an international production to mark the ISY. The film will feature the space programs of all nations and their common goals, and it will premiere in 1992 at the National Air and Space Museum and elsewhere throughout the world. The Museum may also open an ISY exhibit.

The ISY is inspired by the interconnected nature of life. Its goal is to usher in an age in which space policies finally reflect the infinite nature of the universe. Everyone who wants to can, and should, take part. ➤

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**Current space programs and policies ignore the boundless nature of the cosmos.**





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**The Volkswagen way.**





Dawn is breaking on Kenya's Masai Mara Game Reserve. The rising sun colors the rolling grasslands, which stretch south to the Tanzanian border and beyond into Serengeti National Park. To the east rise the Loita hills, and in the west stands the great wall of the Esoit Oloololo Escarpment. A land of plains, forests, and swamps, the 700-square-mile game reserve's population includes giraffes, cheetahs, hyenas, elephants, and lions.

But the roar that shatters the early-morning stillness doesn't come from an

*The Masai Mara has long been home to lions; it's proved to be an equally appealing locale for balloons.*

animal—it's the sound of the gas burners used to inflate hot-air balloons. Over by a stand of trees near Keekorok Lodge, Balloon Safaris, Ltd., is preparing to take another group of tourists aloft into the African dawn.

The Masai Mara is an out-of-the-way spot for a regularly scheduled hot-air balloon service, but since its formation

in 1976, Balloon Safaris has given more than 20,000 people a bird's eye view of the African bush. The company's balloons fly year-round, even during the spring rainy season.

The company's founder is award-winning natural history filmmaker Alan Root, whose works include *The Serengeti Shall Not Die*, *The Year of the Wildebeest*, and *Castles of Clay*. Born in London 50 years ago, Root moved to Kenya at the age of nine. In 1962, when he accompanied two BBC producers on a hydrogen balloon flight across Tanza-





nia from the island of Zanzibar, the young cameraman immediately saw the potential of balloons as silent, slow-moving camera platforms. A balloon could also provide an opportunity to create a complete photographic document, from a close-up of a tiny flower to a wide overview of its surrounding plains.

But the practical difficulties of cost, transportation, and lack of ground crews kept the idea earthbound until 1972, when Root bought his first balloon. He named it *Lengai* after Tanzania's last active volcano, and following

# *Up from Africa*

A ballooning company offers a different view of Kenya's wildlife.

Text and  
photographs by  
Robert Caputo









*Lifting off in a balloon takes a lot of hot air, which is provided by flames from gas burners (above).*

*Besides the obvious advantages, balloon flights help reduce vehicle traffic around animals on the reserve.*

10 days of practice made his first filming ascents, photographing wildebeest on the Serengeti.

The first *Lengai* met an unfortunate end when the balloon's nylon envelope fell out of a trailer during a cross-country trip and Root's assistant, oblivious, dragged it for 30 miles across the African bush. Undeterred, Root bought a second *Lengai* and with his wife, Joan, made the first balloon flight over 19,340-foot Mt. Kilimanjaro, a trip that ended with a tense interrogation by Tanzanian officials, who accused the couple of spying. The Roots also bought a second balloon, named it *Mawingo*, Swahili for "clouds," and filmed a documentary titled *Safari by Balloon*.

During the filming, a number of tourists asked Root for rides. "A tourist business seemed a good idea," he says, "especially as at the end of filming I had two big balloons and nothing better to do with them." In 1975, he and New Zealander John Hawkins made test flights in Masai Mara, and on January 3,



*Occasionally the ground crew provides some extra oomph to move a basketful of passengers around.*

1976, Root piloted the inaugural flight of Balloon Safaris, Ltd.

He chose Masai Mara partly because its abundant wildlife made it popular with tourists, but mainly because the reserve offers a perfect environment for ballooning. The open, gently rolling plains provide plenty of landing sites and easy terrain for the chase cars that follow the balloons. The air is almost always calm until about 8:00 a.m.—an important factor, since balloon pilots will not fly in winds stronger than 15 mph. On those rare days when high winds preclude flying, passengers are offered a flight the next day, if space is available, or a refund.

"The amount of interest in the balloon flights is phenomenal," says chief pilot Dudley Chignall, one of five pilots employed by Balloon Safaris. "People are on vacation having a wonderful time, and they see a balloon flight as icing on the cake. Quite a number of our passengers sign up on the spur of the moment the night before the flight. For some reason it's usually the women who get most excited—I leave them alone while they talk their husbands into pulling out the credit card."

The price of a ticket—about \$225—is steep, but it helps defray costs unique to a service operating in the remote African bush. The balloons and many of the supplies are subject to stiff import duties when they arrive in Kenya, and everything from gas for the burners to croissants for breakfast has to be trucked in from Nairobi, 150 miles away. The expensive nylon balloon en-

velopes last only about half as long as they would in Europe or North America because of the intensity of the solar radiation at Masai Mara's 5,000-foot elevation and equatorial location. Root's three balloons—two that carry 10 passengers each and one that carries eight—are treated with polyurethane, which makes them more airtight and radiation-resistant. The coating also resists snagging on thorn trees in less-than-perfect landing sites.

Most of the balloon passengers drive in from Nairobi to one of several lodges or tent camps in the reserve. Balloon Safaris' home base is Keekorok Lodge. From its verandah tourists can gaze out over a large lawn—which gets most of its trimming from zebras, buffalos, and gazelles—to a water hole and the plains beyond. Some visitors have been startled by animals drinking from the swimming pool late at night. Tourists are also cautioned that shoes left outside the door for polishing may be snatched away by hyenas.

In the early morning the passengers, loaded down with cameras and video gear, climb into the balloons' baskets. Before takeoff they are briefed on the basics of ballooning and how to crouch in the baskets during landing. They are also told not to be alarmed by the sudden roar of the burners, which the pilots turn on to heat the air in the balloons and lift slowly off the ground, over the trees, and up above the lodge.

The winds determine flight direction, and in the early morning over the Mara

*The Wakikapu are known for their love of photographic equipment and a good breakfast.*





they tend to be westerly. Wind direction can vary with altitude, so the pilots can change direction by changing height. To get away from the lodge, the pilots often have to take the balloons up to a thousand feet before they pick up a wind that will sweep them out over the plains.

Passengers usually grow very quiet at this point, partly due to the "Root effect," the perception that the sides of the basket shrink as one gains altitude. But the vertigo disappears as they get caught up in the search for African wildlife—giraffes, perhaps, or some of the 1.4 million wildebeest that migrate into the reserve each year from the plains of the Serengeti.

As the balloon ascends, it slowly unveils a panorama of rolling savanna and rounded hills, with intermittent groves of acacia woodlands and dense thickets of scrub. Thin seasonal streams lace the plains, which are home to Kenya's largest population of lions. In all, Masai Mara can boast 92 species of mammals and 450 species of birds, 53 of which are birds of prey.

Once they've spotted a pride of lions or a herd of elephants or Cape buffalos, the balloon pilots can often bring their passengers within close camera range. The large animals, not naturally fearing predation from the air, are usually unconcerned until the pilots switch on the burners. Startled by the sudden noise, the animals flee from the huge and unfamiliar object roaring in the sky.

Floating high above the vast plains, the passengers get a sense of the romance and timelessness of Africa. The balloons move with the wind, so there is no air against the face, no sensation of movement. It feels more as if the balloon is hovering motionless while the earth slowly rotates below. The grasslands, bright green in the rainy season and golden brown in the dry, teem with an abundance and diversity of life that speak of the complex web of relationships that binds each form to the other and to the African earth. It is easy to imagine early man down below, camped by a stream and competing with his fellow creatures for food.

*Masai Mara is where the buffalo roam—Cape buffalo, not to be confused with the American bison.*







The flights usually last an hour and cover 8 to 10 miles. By then the heat from the rising sun stirs up the winds and the pilots radio the chase crews and look for a clear landing site. Most landings are gentle, but if the winds have picked up, the basket may be dragged on its side for some distance before the pilot stabilizes it. The passengers, crouched in their landing positions below the rim of the basket, cannot see a thing, though they feel the bumps and the rush of grass beneath them.

As the balloonists disembark, they are met by an elaborate breakfast brought by the chase car: eggs, bacon, sausage, chicken, beef Wellington, pastries, and fresh fruit. The ground crew sets up a table and turns the balloon's gas canisters into seats. They hand glasses around, and the pilot uncorks the first of several bottles of champagne. "To the survivors," he toasts. The passengers have become members of the Wakikapu tribe—"the people of the basket."

Root's success has bred competition, and now his company shares the sky with others. That's a mixed blessing. "While balloons can add a touch of magic to game viewing," Root says, "too many can add more than a touch of cheap carnival or fun-fair atmosphere to what is, after all, a national park." There are plans to limit the number of balloons allowed in the park.

But so far the balloons have proven beneficial. "The area west of Keekorok is one of the least damaged areas of the park, despite 10 years of balloon operations," Root says proudly. The benefits to Kenya include the jobs and training the companies provide and the money they pay for customs and duties. The country has also been spurred to develop standards and licenses for hot-air balloons and pilots. And the government has stipulated that a percentage of each fare for a balloon trip must go toward the maintenance of the reserve and the protection of its wildlife.

Alan Root continues to make films, recording East Africa's natural history. His latest camera platform is a Cameron Air Chair. Beneath its small balloon dangles not a basket but a chair for two. Root perches on one side, his camera on the other, taking in an unsurpassed view of the teeming wildlife below. —









Christopher Springmann

# The California Rocket Race

In Silicon Valley, rival groups of entrepreneurs are competing to launch the first privately funded rocket into orbit.

by T.A. Heppenheimer

At an aerospace conference in Monterey, California, this summer, would-be rocket builder Gary Hudson sat glowering in the back of a meeting room while an engineer with American Rocket Company (AMROC) detailed plans to build a low-cost rocket for launching small, lightweight satellites. Lightsats are a pet project at the Defense Advanced Research Projects Agency, and DARPA co-sponsored the conference with an aerospace engineering association to bring together people who might want to build and launch them. Hudson, president of Pacific American Launch Systems, had designed a launcher named Liberty I that he thought was just right for lightsats. He had asked to speak at the session on lightsat launchers but had been turned down by the session's planning committee. The committee was chaired by AMROC vice president Jim French, and Hudson suspected that business rivalry might have kept him off the program. According to French, rivalry had nothing to do with it; noting that other AMROC competitors, such as McDonnell Douglas and Martin Marietta, gave talks on their rockets at the session, he says Hudson's paper was only one of many rejected.

The rivalry goes back to a time when Hudson and some of the founders of AMROC were partners in rocketry. Then, Hudson had the money. Now, AMROC does. In Camarillo, an hour's drive northwest of Los Angeles, AMROC is building a hybrid rocket called the Industrial Launch Vehicle, or ILV. In Redwood City, near San Francisco, Hudson is hunting for money to build the Liberty. McDonnell Douglas and Martin Marietta are offering commercial rockets because they are already geared up to build the same type of vehicle for the U.S. Air Force. Despite their differences, Hudson and AMROC are dedicated to proving that the government and its contractors aren't the only ones that can build and launch rockets.

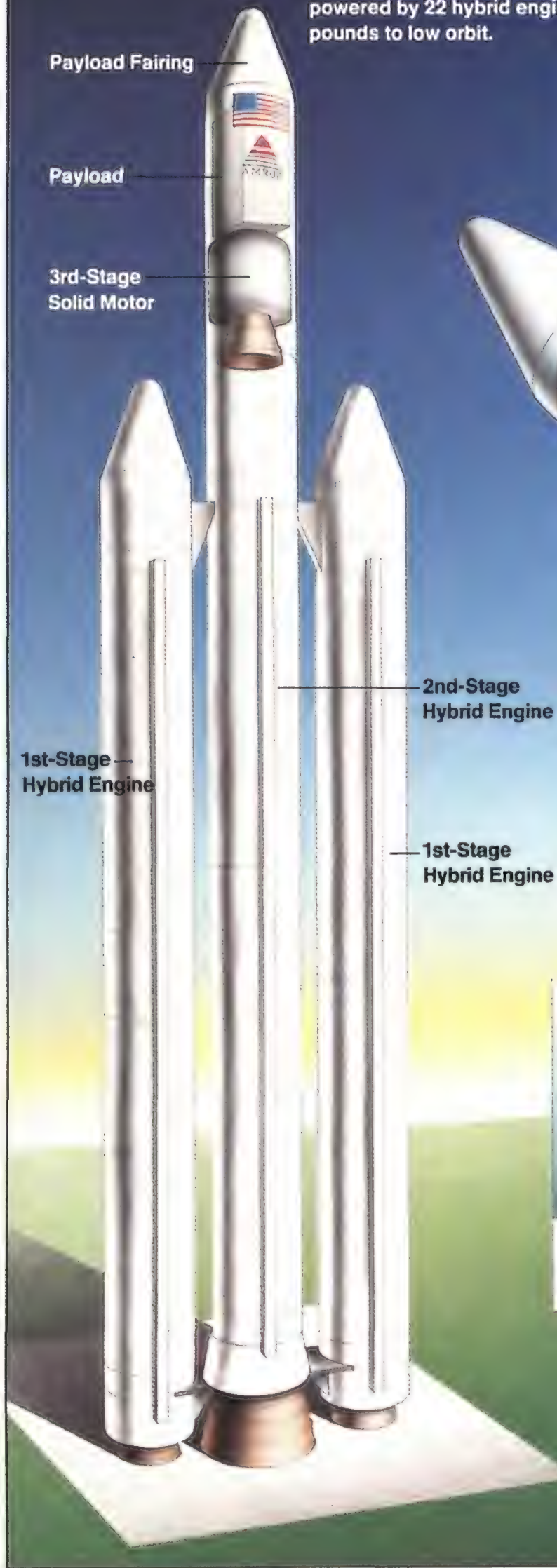
Hudson and the AMROC team began edging toward the rocket business in the late 1970s amid California's community

*AMROC's Koopman, McKinney, and Bennett (left to right) want to see the private sector go into orbit.*



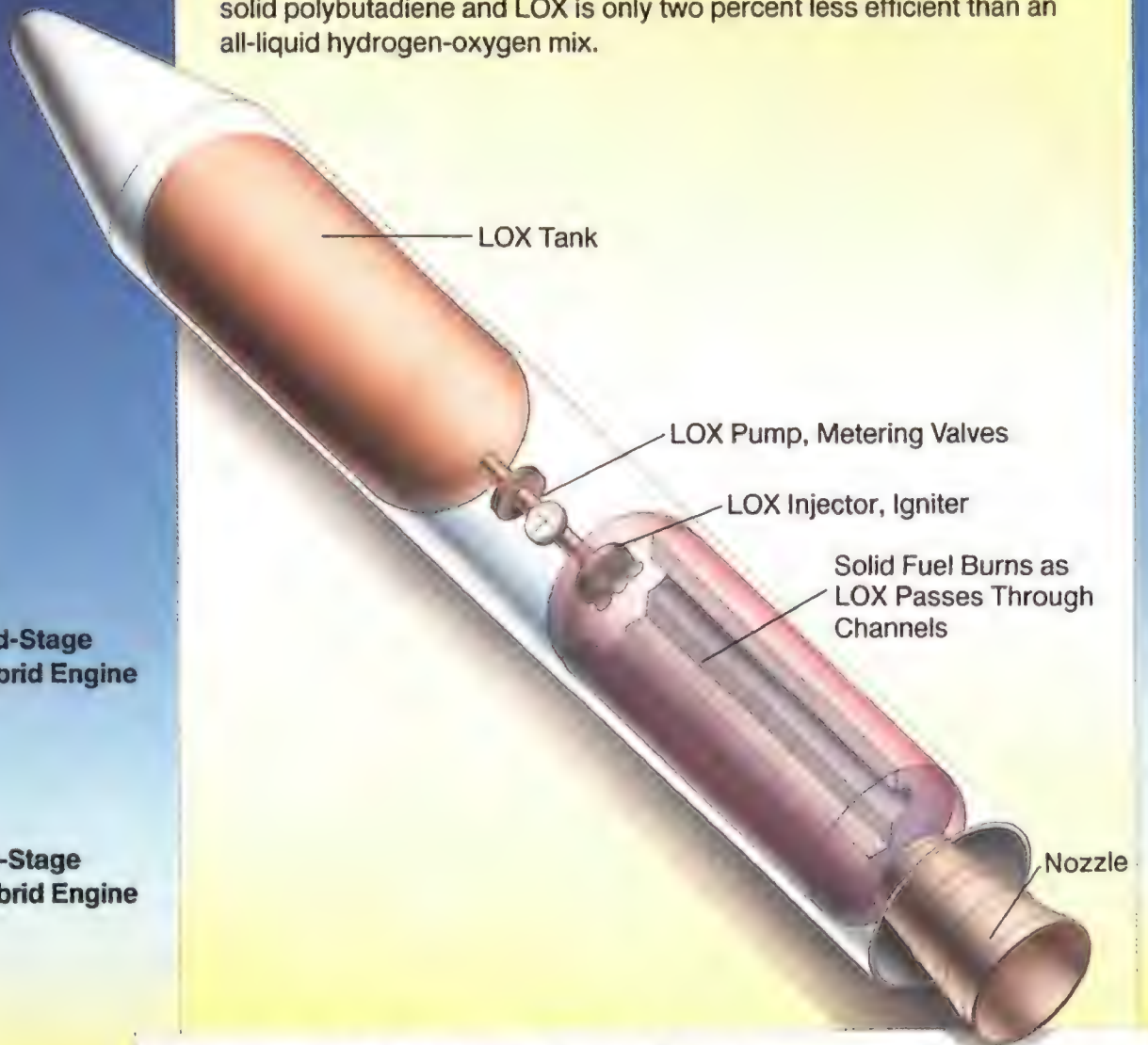
## The Hybrid Rocket: An Old Idea Reborn

The Industrial Launch Vehicle will be a low-cost booster that AMROC officials say the government has no incentive to develop. If the three-stage ILV is successful, a four-stage version may follow, powered by 22 hybrid engines and capable of delivering 3,000 pounds to low orbit.

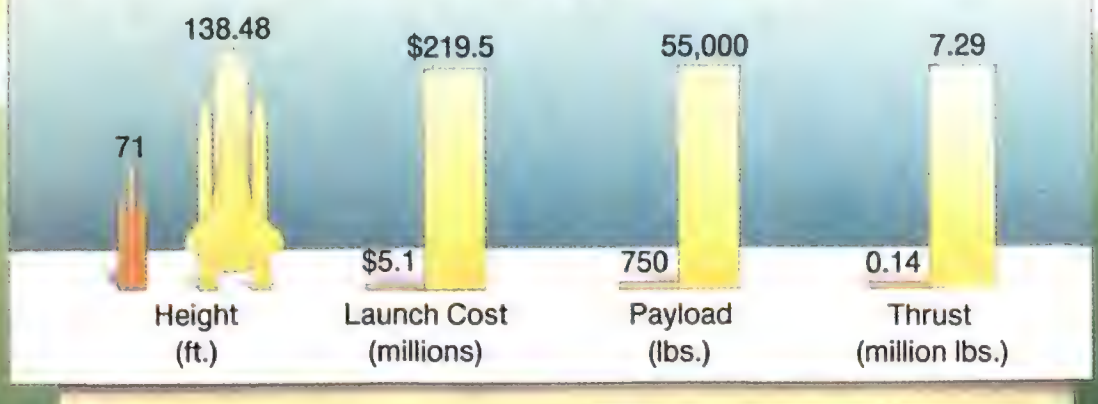


### The Backbone of the ILV

The hybrid engine can be throttled from 0 to 100 percent thrust by regulating the flow of liquid oxygen into solid fuel. The combination of solid polybutadiene and LOX is only two percent less efficient than an all-liquid hydrogen-oxygen mix.



### How the ILV Stacks up Against the Shuttle





of space enthusiasts. One of those enthusiasts was Stan Kent, an Englishman with a degree in astronautics from Stanford University and a job at Aerojet General near Sacramento. At Aerojet, Kent had fallen in with Rudi Beichel, a German rocket scientist who had emigrated to the United States after World War II. Kent was drawn to Beichel's idea of propelling rockets with detonation waves, generated by exploding rather than burning fuel. In the fall of 1977 at a California aerospace conference, Kent met Gary Hudson and turned him on to the concept. The 27-year-old Hudson wanted badly to build a rocket, but so far he'd had to content himself with designing rockets back home in Minneapolis while writing and lecturing about space development to pay the rent.

Prospects for building a rocket improved when Houston space lawyer Arthur Dula, impressed by Hudson's writings, tracked him down and introduced him to David Hannah, a wealthy middle-aged Texan and space enthusiast who had made his fortune in oil and real estate. Hannah believed that Americans needed a new frontier to explore, and he was willing to back up his belief with cash. Hudson met with Hannah through 1978, and in 1979 Hannah gave Hudson and Kent a \$60,000 contract to start a rocket company. In early 1980 Hudson moved to the San Francisco Bay area, but in just a few months he and Kent were arguing over how to proceed, and they decided to part ways.

Meanwhile, another California space alliance was forming that ultimately would merge with the Hudson-Hannah partnership—for a while. In the fall of 1978, space enthusiasts Phil Salin and Gayle Pergamit, who had married that spring, founded the Stanford Center for Space Development at Stanford University, where Salin was working on a master's in business administration. The center was a gathering of space buffs, and meetings of the group featured speakers such as Bob Truax, a retired Navy engineer who had worked with rockets since the 1940s. After retiring, Truax had conceived the Volksrocket, a manned launcher to be built with private financing. The Volksrocket plan struck a chord in Salin. "Most ideas for space industry at the time were incredibly

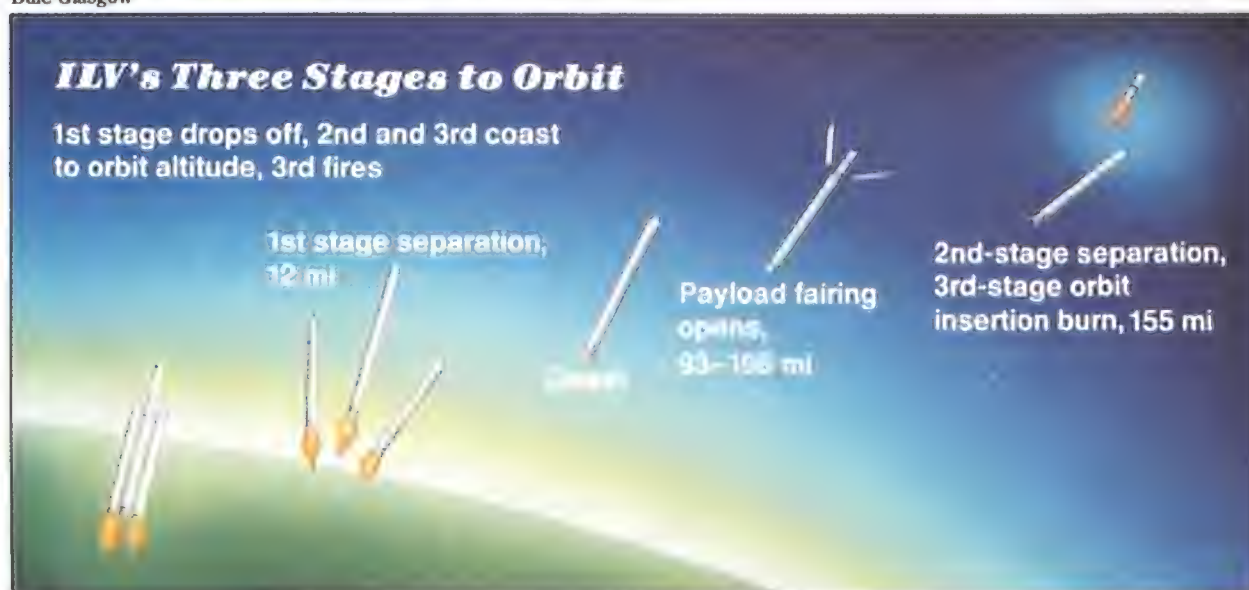
grandiose," he recalls, "space colonies, power satellites, mining the moon." Commercial rockets seemed like a more reasonable way to get into the space business.

In late 1978 Salin and Pergamit met 30-year-old Jim Bennett at a Stanford Center meeting. Bennett had just returned from Santa Barbara, where he'd been working on a proposal for a commercial launch center called Earthport. He'd met Gary Hudson on the project, and the two joined forces with Salin and Pergamit to plan a rocket business. In September 1980 David Hannah loaned the group \$400,000 to get started, but trouble cropped up quickly. Salin's conservative business-school philosophy didn't mesh with Hannah's intuitive, go-for-broke style. Hannah was more in tune with Hudson, a self-made rocket man with no college degree. Hannah and Hudson agreed that the group

three-stage rocket assembled from seven Percheron engines would be able to carry four tons of cargo to low Earth orbit. But Hudson had to start out with a single-engine model for tests. With the Percheron installed in its launcher on Matagorda Island, a Texas cattle ranch, Hudson scheduled an engine ignition test for August 5, 1981.

By the afternoon of August 5, the temperature on the island had topped 100 degrees, and humidity was high. The Percheron's fuel tanks were pressurized and 10 percent full, enough for the test. Separate valves would feed first LOX, then kerosene into the combustion chamber. But high humidity had caused the LOX valve to crust over with ice. Unaware of any problem, the crew turned on the igniter. It worked fine, so the LOX valve was turned on—but because of the ice, it opened 1.2 seconds late. That brief delay permitted kero-

Dale Glasgow



should start building a rocket right away, but Salin wanted to draft a detailed business plan first. To preserve his relationship with Hannah, Hudson severed his ties with Salin and Bennett.

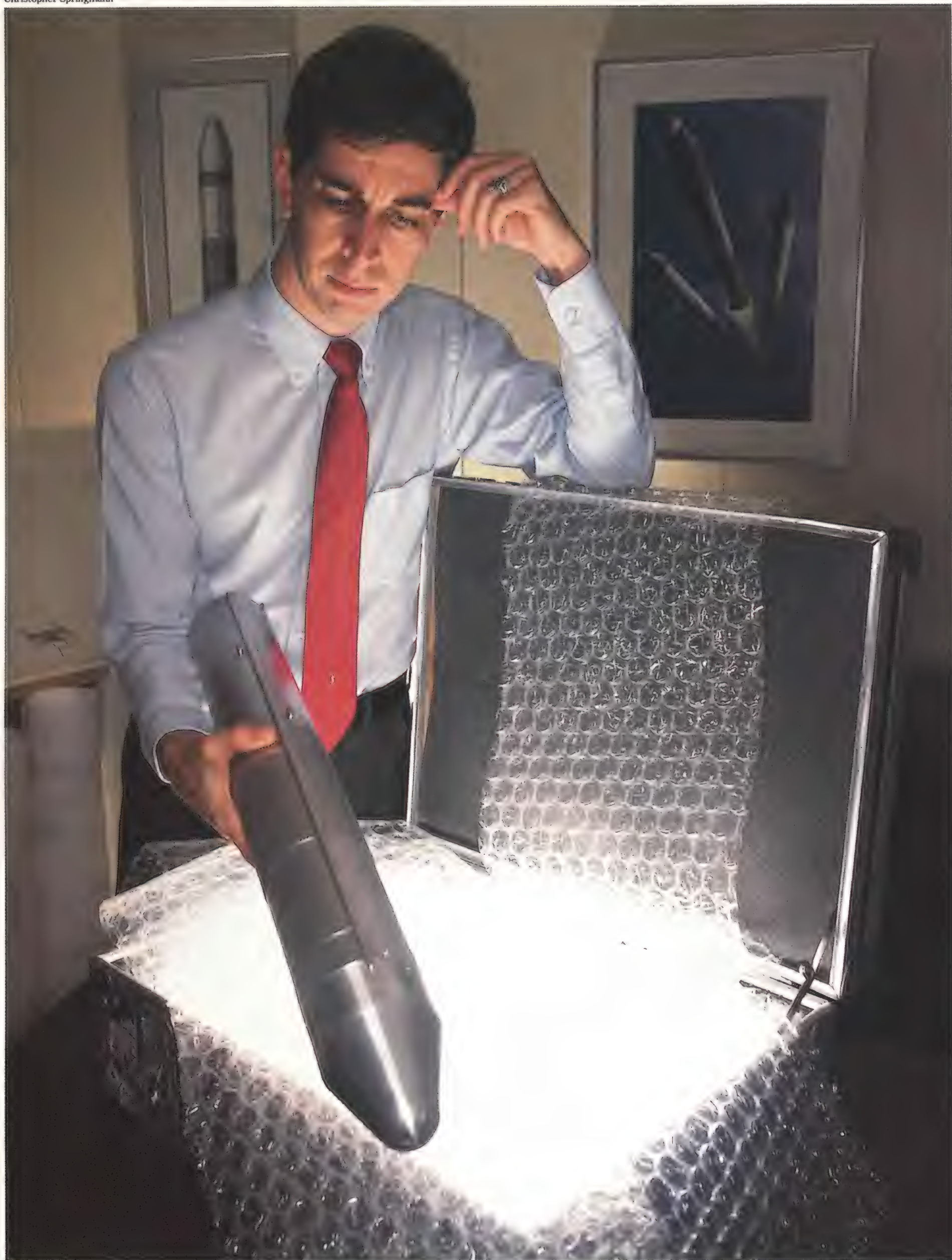
After the breakup, Hudson jumped on the fast track to launching, full of what he now admits was "the arrogance of youth." Salin and company decided to stick together but take their time in setting up a rocket business. Hudson quickly set up shop in Sunnyvale, where a team of engineers began building a rocket called the Percheron.

Through the spring of 1981, the Percheron took shape. It was 55 feet tall, 4 feet across, and fueled by liquid oxygen (LOX) and kerosene fed by pressure from the fuel tank to the engine. A

sene to fill the combustion chamber first, and it began burning on ambient air. When the oxygen hit the fire, the Percheron blew up. The blast tore the rocket from its launcher and threw it hundreds of feet into the air.

Still, Hudson had accomplished a remarkable feat: building a rocket for only \$1.2 million. But his backer, Hannah, wanted more—he wanted a launch. After the explosion, Hannah consulted with engineers from NASA, who convinced him that solid-fuel rockets would be much safer and more reliable. Hudson wasn't interested in switching to solid fuels, so three months after the accident he left Hannah's employ and returned to Silicon Valley. In a Redwood City townhouse, Hudson went to work







designing a new rocket he called the Phoenix, and in March 1982, he incorporated as Pacific American Launch Systems.

A few miles away, Salin and his partners were refining a new rocket design. At a San Francisco L-5 Society meeting in the spring of 1981, they had found a new rocket designer, 31-year-old Bevin McKinney. He had a degree in naval architecture and a longstanding fascination with rockets, having built and tested many in his backyard. Salin's group wanted a rocket that would be safe and easy to operate and could be built in the light-industry facilities for lease around Silicon Valley. McKinney proposed a hybrid rocket, which would be fueled by a combination of liquid and solid propellants.

The U.S. military used small hybrid rockets for airborne practice targets, but no one had ever built a hybrid satellite launcher. McKinney's rocket would be fueled by polybutadiene (a synthetic rubber) and LOX. A pressurized tank would feed LOX through a valve into channels running through the solid fuel. The rocket could be stopped, started, and throttled up or down by adjusting the LOX flow, and the solid fuel was not explosive. A hybrid rocket would be heavy and less efficient than NASA's latest designs, but it would be cheap and reliable. Another new approach the group decided on was launching from the water, which would eliminate the need to build a launch pad or obtain permission to use a government site. The rocket would be towed to sea, dumped in the water, and kept upright with ballast for launching. Because it would leap from the sea, it was named the Dolphin.

The group solicited investments from some of Silicon Valley's most successful entrepreneurs and raised enough money to test-fire some small rocket engines at a Nevada site. The success of the tests brought in more investors, including Steve Wozniak, co-founder of

Apple Computer. By mid-1982 the partners had raised almost \$1 million and incorporated as Arc Technologies.

They then decided to invite former Apple president Michael Scott into their fold. Arc needed an experienced production manager like Scott, though the group was wary of his record. He had been vice president of manufacturing at National Semiconductor when he was hired away by Apple. Once established as the computer company's president, on a day that later became known in Silicon Valley as Black Thursday, Scott fired some 40 key employees.

Still, the Dolphin developers wanted him on board. Scott was interested in rockets; he was also worth more than \$100 million. Eventually he would put \$7.3 million into Arc. He took over Arc's presidency from Salin at the end of 1982, and it wasn't long before the two were knocking heads. Salin wanted Arc's founders to have a hand in corporate decision making, but Scott was not amenable. One unilateral decision Scott made that drove the founders up the wall was to rename the company Starstruck, a label that hardly fit their hopes for a business that would command respect. In May 1983, Salin and Pergamit left the company. McKinney followed in January 1984. Bennett stuck around.

Success came on August 3, 1984, after three failed launch attempts and nearly three years to the day after Hudson's Percheron exploded. A Dolphin rocket was lowered from a barge into the Pacific, not far from San Diego. It was 50 feet tall, 3.5 feet across, and built to generate 42,000 pounds of thrust. Held vertical in the water by

concrete ballast, its hybrid engine ignited underwater, and the rocket took off on a 15-second flight. Arc had spent \$10 million to reach this point.

Less than two weeks later, Starstruck president Scott fired almost everybody on the payroll. No one knew what was going on. Scott said he was reorganizing the company, but his investment in Starstruck was mainly in the form of a loan and he owned only 20 percent of the company; he could not outvote the founders and early investors who owned the other 80 percent. He toyed with starting a new rocket company but quickly dropped the idea. In September 1984, the founders of Arc gathered around Salin's kitchen table to discuss the future of the business. George Koopman, a California entrepreneur and space buff, was there to offer advice. Salin had tried to bring Koopman into Arc on the same day Scott was hired, but Scott had promptly dumped him. Koopman had an interesting résumé: producer of stunts and special effects for the movie *The Blues Brothers*, friend and co-author of former LSD guru Timothy Leary, manager of a speakers' bureau that offered Leary along with dolphin expert John Lilly and some UFO aficionados. And he had recently revived a small construction company that had gotten into trouble by growing too fast.

Koopman, Salin, and Bennett spent the next six months trying to negotiate a deal with Scott to save Starstruck, but by March 1985 it was clear they were getting nowhere, so they gave up. Months later, Starstruck liquidated. Meanwhile, Salin and Pergamit formed a management consulting firm called Venture Acceleration and took on jobs for the computer industry. But in April 1985, having severed his ties with Starstruck, Bennett showed Koopman a proposal that he'd discussed with McKinney for a new rocket company to be started from scratch. In late May, the three decided to set up shop as American Rocket Company. As Koopman describes it, "Like all good Silicon Valley companies, we were incorporated on a Tuesday, we leased offices on a Wednesday, we rented furniture on Thursday, and the phones went in on Friday morning." By Friday afternoon a man from the Air Force was at the door,

Jim Bennett



*Gary Hudson is waiting for the funding that can raise his Liberty rocket out of the cradle (left).*

*Naval personnel at a nearby gunnery range were startled by the Dolphin's watery launch.*



interested in doing some business.

McKinney designed a new hybrid launcher; the solid fuel would still be polybutadiene, but it would include what Koopman calls "secret herbs and spices"—proprietary additives to improve performance. Launches would be on land—the military proved to be willing to lease launch sites to commercial rocket operators. AMROC would test engines at the Air Force Astronautics Laboratory, then launch rockets from Vandenberg Air Force Base. By the end of 1985 AMROC had raised enough money to lease suitable facilities in Menlo Park. Moving day was set for January 28, 1986.

Koopman woke up on January 28 to the news blaring from his clock radio. It

the shuttle. Hudson had been arguing for some time that the United States should have a variety of space launch vehicles. But it didn't, and he believed that the shuttle accident threatened to put the country out of the launching business. "That first day people were saying that we may have the shuttle flying again by June. It was almost heartbreakingly humorous," Hudson says. "I knew we'd be down for at least a year and probably more like two." Putting the Phoenix aside for a while, he produced a design for a two-stage rocket that could put satellites into geosynchronous orbit. The first stage would be a large version of the Percheron, with pressure-fed engines running on LOX and kerosene. The second stage would

fer users "freedom of choice" in satellite boosters, and "freedom from fear" that valuable spacecraft would end up stuck on the ground.

These days, Hudson is peddling two versions of Liberty—a 25-ton Liberty I, 60 feet tall and 5 feet across, which could deliver a 500-pound lightsat to low orbit; and his original Liberty II. He says that if he got an order, he could build a rocket from off-the-shelf components in 12 to 18 months. He hasn't built one yet, however; he's still looking for investors. But he's optimistic that money and business will materialize, with NASA and the military desperate for access to space.

AMROC is far ahead of Pacific American in the race to put the first commercial rocket in space. A pair of hybrid AMROC engines named Jake and Elwood, after the Blues Brothers, were retired in 1987 after a series of test firings. AMROC ran more tests on a third engine named Dr. Tim (Leary, that is), and a new series of firing tests began last fall with Calvin and Hobbes, the latest pair of engines. Koopman says AMROC has a staff of 75 and "millions and millions" in financing, but he won't say anything more about money. AMROC is planning a suborbital test launch of a single-engine rocket for early 1988. If that goes well, the company might shoot for a first launch to orbit in early 1989, with a three-stage ILV powered by three hybrid engines.

The California space movement has spawned many grand ideas that have not materialized—Earthport, the Volksrocket, and the Phoenix are just a few. Some people have dropped out of the rocket race just as quickly as they dropped in: Hudson has lost touch with Stan Kent—the last he heard, his ex-partner was running a Bay area punk rock club. Michael Scott is living in Silicon Valley, presumably investing in businesses other than rocketry. David Hannah is still in the rocket business; he's invested in Space Services Incorporated, a Houston company run by ex-astronaut Deke Slayton. Hudson swears he's going to build the Liberty. And AMROC is counting on results from its ILV in 1988. Whatever develops, it will take more than a launch failure or an empty bank account to force the California rocketeers out of business. ➔

AMROC



was live coverage of the launch—and destruction—of the space shuttle *Challenger*. He and his colleagues met in the office, in shock. Once they settled down, they agreed that the accident had no bearing on their business plans. They had already decided to market their ILV for the lofting of low-orbiting satellites too small to justify the expense of a shuttle launch.

A friend phoned Gary Hudson that morning to tell him the bad news about

*AMROC rents engine test stands from the Air Force; leasing Air Force launch pads is more difficult.*

feature pressure-fed engines fueled by LOX and liquid hydrogen, a higher-energy combination. The rocket would weigh about 300 tons at liftoff and could take 10 tons of payload to low orbit. Hudson called it Liberty II. In the words of his advertising brochure, it would of-



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Business in Hong Kong is so much easier when you make the right call in the first place.  
The Friendly Skies.

A man in a dark suit and tie is smiling while talking on a payphone. He is holding a small notebook. The payphone is mounted on a red wall. Behind him is a large, ornate golden dragon sculpture with red accents, set against a dark background with traditional Chinese patterns.

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A Fawcett Magazine

JULY

# CAPTAIN MIDNIGHT

10¢  
NO. 42



**A PANORAMA OF SKY PERILS!**

**CAPTAIN MIDNIGHT, CRUSADER OF THE CLOUDS**



# The Flight Against Evil

Swooping out of the night sky,  
the aviator known as  
Captain Midnight served  
for two decades as an invincible  
champion of justice.

by Jay P. Spenser

A bell tolls mid-  
night. Suddenly  
its mournful echo  
is drowned out by the furi-  
ous wail of a diving airplane.  
An announcer's voice rings  
out: "CAP-TAIN MIDNIGHT!  
*Brought to you every day, Monday  
through Friday, by the makers of  
Ovaltine!*"

Our radio adventure begins as dark-  
ness falls on a World War I aerodrome  
somewhere in France. In a dark tent,  
Major Steele and a high official of the  
U.S. government brief a captain on a  
desperate mission as shells crump on  
distant battlefields. The success of the  
Allied cause hangs in the balance.

"What name you will be known by,"  
the official concludes, "rests in the  
hands of Fate."

"Sir, if I am not back by midnight,"  
the young volunteer responds, "you will  
know I have failed."

With these words, he exits and climbs



into a SPAD fighter.  
The engine roars as  
the lone biplane disap-  
pears into the night.

The hours pass. "Fifteen se-  
conds before twelve," the offi-  
cial proclaims, his voice heavy with  
despair. "Looks like we're all sunk. Too  
much to ask of one man—"

"Listen, do you hear it?" the major  
interrupts.

"Yes . . . *It's a plane! He's done it!  
We're saved!*"

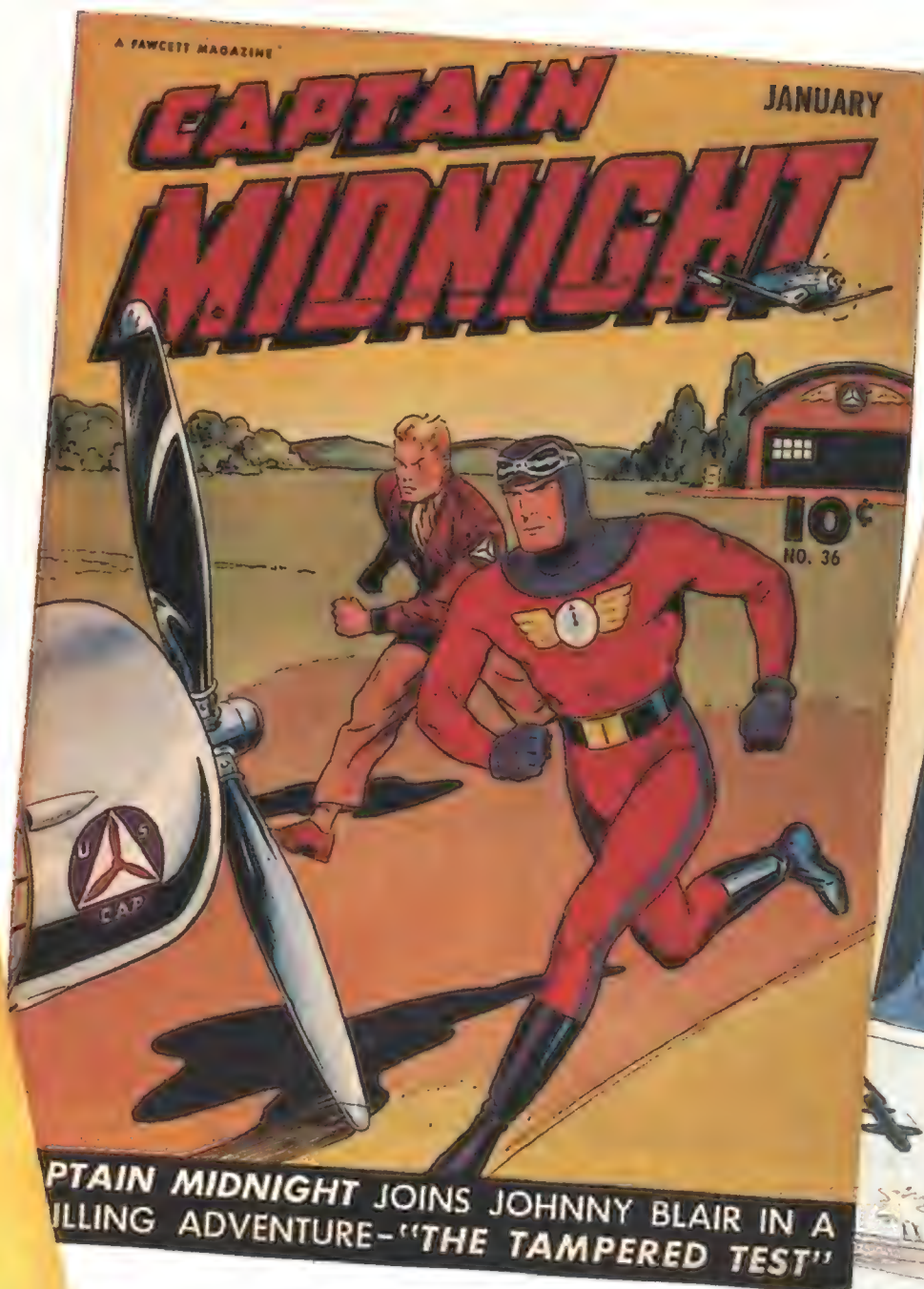
"And it's just twelve o'clock!" Major  
Steele notes. "To me, he will always be  
Captain Midnight!"

Yes, Captain Midnight, intrepid pilot,  
commander of the Secret Squadron,  
nemesis of spies, saboteurs, and master  
villains, and star of radio, television,  
films, books, and comics. For two de-  
cades this fictional flier soared high in  
American popular culture, yet today  
people are likely to ask, Captain *Who?*

Captain Midnight was the brainchild  
of a pair of World War I veterans. Rob-  
ert Morris Burt, a 22-year-old second  
lieutenant from Massachusetts, had  
flown SPADs over France in the final  
weeks of the war. British pilot Wilfred

*Whenever villainy threatened, Red  
Albright became the man of the hour—  
and his hour was midnight, as his  
insignia showed (above).*





Gibbs Moore had flown rakish S.E. 5a fighters with the Royal Flying Corps. After the war the suave Englishman made his way to the United States, where his eloquence got him a career in radio.

The radio era began quietly on November 2, 1920, as station KDKA reported election returns from a shack atop a six-story building in east Pittsburgh. The first nonexperimental broadcast in U.S. history may well have surpassed Warren Harding's victory that night in significance. By 1933, when President Franklin D. Roosevelt began his "fireside chats," radio was the nation's most influential medium. Cumbersome sets brought Americans the funeral of England's King George V and the abdication of his successor, Edward VIII, the tirades of Adolf Hitler and Benito Mussolini, the fiery destruction of the airship *Hindenburg*, Jesse Owens'

*Captain Midnight and his cohorts fought for freedom in Fawcett comic books from 1942 to 1948. But it was postwar apathy, not Nazis, that finally defeated the leader of the Secret Squadron.*

*In Joyce of the Secret Squadron, the aviatrix shed her retiring radio role for the part of the clever heroine.*



"Captain Midnight!" Joyce Exclaimed. "Look!"





Olympic victories in Berlin, Amelia Earhart's disappearance over the Pacific—all the news of the day with an immediacy newspapers could not achieve.

The airwaves also brought music, amateur hours, game and variety shows, and—best of all—fiction: "Amos 'n' Andy," "Dick Tracy," "Ma Perkins," and "The Shadow" were among the most popular. Radio went too far with Orson Welles' 1938 Mercury Theatre adaptation of H.G. Wells' *The War of the Worlds*, the famous Halloween eve broadcast that convinced thousands that Martians were invading Earth. A sobering lesson in the power of radio, it pushed broadcasting toward greater maturity and responsibility on the eve of World War II.

*The War of the Worlds* and world war were still some years in the future when Burt, a journalism degree from Columbia University in hand, moved to Chi-

cago to work as a writer. There he met Moore, a kindred spirit who also loved flying, adventure, and radio's exuberant adolescence. They embarked on a successful collaboration that produced "The Air Adventures of Jimmy Allen" in 1933, a radio adaptation of comic strip aviator "Hop Harrigan" in 1942, and a series starring a flying rancher named "Sky King" in 1947. But their greatest success came in 1939 with "Captain Midnight," a mysterious aviator sure to dive out of the night sky wherever trouble was brewing.

"Captain Midnight" took to the airwaves sponsored by the Skelly Oil Company. An immediate hit, this regional broadcast from Chicago station WGN attracted the interest of the makers of Ovaltine. In 1940 the chocolate-drink-mix maker brought "Captain Midnight" to the Mutual Radio Network (and later NBC's Blue Network) for coast-to-coast

broadcast.

*Captain Midnight's* network debut on September 30, 1940, opened with the tale of the World War I SPAD flight. Returning to the present, the audience followed Red Albright (Captain Midnight's civilian alias) to a farm in Virginia that was in fact the headquarters of a new quasi-military crime-fighting organization called the Secret Squadron. Before the 15-minute episode was over, youngsters—and a fair number of adults—heard Captain Midnight accept command of the Squadron with an oath beginning, "With full realization that death may be my lot . . ."

Burt and Moore gave their hero his own air force, secret bases around the United States, and access to all the scientific devices they and other scriptwriters could dream up. Assisting Mid-





night (code number SS-1) were teen-age pilots Chuck Ramsay (SS-2) and Joyce Ryan (SS-3), scientist William Kelly (SS-11), and mechanic Ichabod—"Ikky"—Mudd (SS-4). Chuck and Joyce appealed to young listeners of both sexes; Ikky, Captain Midnight's sidekick, supplied comic relief. On the side of evil the cast featured Ivan Shark, his assistant Fang, and his beautiful but ruthless daughter Fury.

Secret Squadron members carried decoder badges called Code-O-Graphs that figured in many episodes. Boys and girls at home were encouraged to join the Secret Squadron and get their own Code-O-Graphs by sending a dime and a proof of purchase to Ovaltine.

Captain Midnight's crisp command to "stand by for another Secret Squadron code session" gave listeners the thrill of participation as they decoded strings of numbers into secret messages. These messages often concerned Ovaltine, the consumption of which seemed to be the primary duty of every Secret Squadron member. "Captain Midnight wants you to drink rich, chocolaty Ovaltine," the show's announcer explained, "because he wants you to grow up stronger and huskier, with more pep and ginger!"

Captain Midnight was never assailed by doubts, he saw no distracting shadings between right and wrong, and he always did everything perfectly. Best of all, he was a pilot in an age when pilots were naturally heroes. The public wanted glamour, and the media found it in larger-than-life fliers like Roscoe Turner, three-time winner of the dangerous Thompson Trophy speed race. Turner had twinkling eyes and a dazzling smile, wore a uniform of his own design, called himself "Colonel," and took his lion cub Gilmore flying with him. There was also the Russian count Alexander de Seversky, an industrialist and bon vivant whose adventures as a World War I ace left him with a wooden leg. Jimmy Doolittle, Al Williams, Amelia Earhart, and other aviators of the time performed deeds that made Captain Midnight seem far less improbable than he does now.

*The 1950s TV series added scientist Tut (Olan Soule) as Captain Midnight's (Richard Webb) assistant.*





The television and radio series offered premiums ranging from sew-on patches and Ovaltine mugs to Code-O-Graphs and initial rings. The manuals helped explain it all. Once nickel-and-dime novelties, many are now collector's items.





The Shark and his men often got the heroic aviator up against the wall, but never for long (right).

NASM



In 15 cliff-hanger episodes, threats to Captain Midnight ranged from airplane crashes to shovels.

The military, Hollywood, and high society—with wealthy “sportsman pilots” like Howard Hughes and Henry du Pont—all contributed to aviation’s allure. Schoolchildren dreamed of “ships” and “crates” and idolized supermen who wore helmets, goggles, leather jackets, and jodhpurs; they built wood-and-tissue models of Gee Bees and Travel Airc; they read *G-8 and his Battle Aces*; and they listened to “Captain Midnight.”

The program took them to the far corners of the globe, combining fast action and evocative sound effects. Records provided the throb of Captain Midnight’s airplane, birdseed on sheet metal served as rain, crumpled cellophane simulated a crackling fire, air bubbling in a trough conjured up a surfacing submarine. The narrative was punctuated with shots, breaking glass, creaking doors, fiendish electrical hums, footsteps in gravel. “Sounds and words made the picture,” remembers Ed Prentiss, national radio’s Captain Midnight, “how they were written and how they were read. The picture in the mind of the listener was far greater than anything the camera could make.”

The live format guaranteed that things would occasionally go wrong. One episode called for Captain Midnight to assert, “What we need here are some mop-up operations!” On the air Prentiss heard himself saying, “What we need here are some mop-up-up-up-up-up-up . . .” Far worse, the next line in the script was, “That’s what I like, a man with a quick tongue!” The next actor helplessly read his reply and the humor was more than the cast could take. Announcer Pierre André—whose stirring voice opened every episode—saved the day with a commercial.

The adjectives *lonely*, *mysterious*, *speedy*, *powerful*, and especially *secret* were used at every turn. “You call, master?” a voice echoed in an underground chamber. “Yes, Fang, but first, close the secret door behind you.”

Ivan Shark and Fang might well have been discussing their slipping ratings. In the 27 months between the start of





*Playing Captain Midnight on the silver screen was the high point of Dave O'Brien's acting career.*

World War II and America's entry into the conflict, far more serious evils than Shark and Fang had risen to threaten the world.

The United States had emerged from World War I convinced that it must never again be drawn into a European war. Isolationism prevailed throughout the 1930s. In keeping with the national mood, radio struggled to remain neutral, even while airing front-line reports by Edward R. Murrow, William L. Shirer, Eric Sevareid, and other foreign correspondents. Network neutrality policies extended to entertainment broadcasts, preventing Captain Midnight and other fictional heroes from taking on Axis spies and saboteurs. The captain was allowed to fight the foes of freedom abroad only if he remained vague as to their identity.

In a late-1941 episode, Captain Midnight foiled agents of an unnamed nation who had been plotting to sink a ship at the mouth of Pearl Harbor and thereby bottle up the U.S. fleet for aerial attack. Two weeks later life imitated art, and Burt and Moore had to convince FBI agents that the striking coincidence was indeed just that.

Roosevelt's "day of infamy" speech on December 8 thrust the United States into a war for which it was largely unprepared. The grim early days of the conflict propelled Captain Midnight to dizzying heights of stardom. The neutrality restraints were finally removed: Captain Midnight and the Secret Squadron struck devastating blows at America's real enemies five times a week.

The captain was not alone, of course: Don Winslow of the Navy, Hop Harrigan, Terry and the Pirates, and Jungle Jim also fought overseas while Superman, Dick Tracy, Jack Armstrong, Tom Mix and His Ralston Straight-Shooters, and The Green Hornet kept things safe back home. Their battles boosted morale on the home front, reinforcing the belief that goodness, freedom, and democracy would prevail.

NASM



In 1942 Captain Midnight became a movie star in Columbia Pictures' serial of that name. Suitably garbed in black leather flying togs emblazoned with his personal insignia, a winged clock with both hands pointed at 12, actor Dave O'Brien ably played the role through 15 installments with titles like "The Drop to Doom," "Burning Bomber," and "Death in the Cockpit." He escaped crashes, survived gunfire while para-

Richard Moy



chuting, and eluded other horrible fates before finally triumphing over perennial nemesis Ivan Shark.

While the celluloid Captain Midnight enjoyed his popularity, World War II's very human toll was already working its changes on American society. By mid-decade, flawless 1930s-vintage heroes who never received a scratch were no longer widely credible. Hollywood began producing tougher war films, culminating in *The Best Years of Our Lives* in 1946 and *Twelve O'Clock High* in 1949. Radio, however, was not well suited to this new realism.

Captain Midnight saw the handwriting on the hangar wall: however successful he had been, he would have to change in order to survive. In his first foray into the graphic arts, a 1941 newspaper comic strip, Captain Midnight tried out a black leather helmet with a scarlet goggle strap and a gold-trimmed, midnight-blue flight suit with his winged clock emblazoned on the tunic. In the 1942 children's book *Joyce of the Secret Squadron*, the Great War ace adopted black turtleneck, jodhpurs and boots, and an avuncular attitude in keeping with his 40-odd years. Then in September of that year, a rejuvenated Cap-

tain Midnight—with rippling muscles and a hawk nose—showed up in his own Fawcett comic book, dressed in crimson jacket and jodhpurs with his insignia on his chest.

But before too many issues had gone by, he sadly went the superhero route in a skin-tight crimson uniform and cowl-like helmet, with only his goggles remaining to suggest his aviation heritage. As if that weren't enough, Captain Mid-

*Douglas Aircraft provided the Silver Dart, a model of the company's Skyrocket, but not its runway.*

tain Midnight developed a taste for gadgetry that outstripped even Batman's: he carried in his belt a doom-beam torch, a swing spring, a radio, blackout bombs, and substantial lengths of plastic wire. He also took to wearing boots with knives in the heels, and equipped his uniform with a gliderchute—folded fabric that would pop out between his outstretched arms and legs and allow him to transfer between airplanes in flight or descend safely to earth.

Fawcett illustrators wisely stopped short of giving Captain Midnight the ability to fly that most comic book heroes had; it would have obviated his need for an airplane, and airplanes were the best part. Well-drawn Spitfires, Staggerwings, and countless other recognizable types winged through the pages of this otherwise uninspired comic book before its demise in 1948.

The radio series ended soon after, a victim of changing times (desperate writers had created Wolfgang the ex-Nazi for Captain Midnight in 1948) and

substantial audience defection to the new medium of television. On December 15, 1949, Ivan Shark met his well-deserved end at the claws of a polar bear and the series left the air.

But Captain Midnight was destined to fly again, this time in a top-rated television series launched in 1954. Veteran film and TV actor Richard Webb—tall, blond, dashing, handsome and well spoken—was ideal for the role; in a suede flight jacket and an authentic Air Force helmet he became the quintessential Jet Age man of adventure. The cold war, espionage, subversion, atomic bombs, radiation, and old-fashioned crime occupied Captain Midnight in the postwar era. Hitler's SS had forever tarnished the Secret Squadron's initials, so television's Squadron adopted SQ for its symbol. From SQ headquarters, a mountaintop laboratory, Captain Midnight flew his sleek *Silver Dart* rocket plane off a terrifying runway supported only by girders. The Douglas Aircraft Company in California furnished the *Silver Dart*, a model of their D-558-2 Skyrocket high-speed research aircraft, which had attained twice the speed of sound in 1953.

Although "Captain Midnight"—which aired in some areas under the name "Jet Jackson, Flying Commando"—consistently attracted a then-impressive 16 to 20 million viewers, it didn't convince enough of them to drink grainy Ovaltine instead of the new, smoother chocolate drinks. "Captain Midnight" left the air in 1958.

Thirty years later, we may well wonder if there is any place left for Captain Midnight in American popular culture. The world seems too big, too complex for today's sophisticated children to believe in a lone aviator and a shadowy airplane. But their parents believed, and they remember. Ovaltine is now test-marketing "Classic Ovaltine" with a promotion based on the original Captain Midnight TV show.

Besides, heroes of the sky are an American archetype. There may again come a time when we want the help of that mysterious flier whose symbol is a winged clock with hands pointing to midnight. Until then...

"This is Captain Midnight signing off with the code of the Secret Squadron—justice through strength and courage. Out." ✈



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## **MCDONNELL DOUGLAS**

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On a stiflingly hot and muggy July evening, the dunes at Jockey's Ridge State Park in Nags Head, North Carolina, are awash in a colorful swarm of hang gliders. Many pilots of the triangular Dacron butterflies are students from across the highway, where Kitty Hawk Kites, the world's largest hang gliding school, introduces up to 10,000 people to the sport every year. "We get some of the highest steady winds on the East Coast here—up to 25 miles per hour," says John Harris, the school's director. This evening, however, the winds are average—15 mph—and the people gliding over the dunes are searching more for a cool breeze than perfect technique.

Standing at the foot of a dune is a man in shorts, Hush Puppies, and dark socks, looking somewhat out of place among the younger crowd fluttering overhead. Francis Rogallo gave them their wings, but the fliers don't recognize him. It's just as well. Now 75, he can walk the beaches in solitude for hours, admiring the descendants of his creation wheeling above. The constant cloud of hang gliders at Jockey's Ridge was one of the reasons he retired to nearby Kitty Hawk.

Forty years ago Rogallo was an aeronautical engineer at the Langley Laboratory in Hampton, Virginia, a branch of the National Advisory Committee for Aeronautics (NACA). By day he tested aircraft models in wind tunnels and worked on designs for flaps and ailerons, which influence lift. At night he dreamed of ways to make flight affordable for everyone. "My idea was to invent a completely flexible wing," he says. "It would be foldable, making an



# ***FLEXIBLE FLIERS***

by Michael Rozek

*Photographs by  
Brownie Harris*

Francis Rogallo's folding wing gave rise to the carry-out airplane.

airplane portable and cheap to store."

Rogallo pictured a device with the aerodynamics of a rigid wing and the flexibility of a parachute. "People had experimented with the flight possibilities of sails as far back as da Vinci," he says, "and parachutes go back almost 200 years. But no one had made a fully flexible wing." To Rogallo, the only mystery was why no one had come up with such a simple and logical device.

In 1948 Rogallo, his wife Gertrude, and their three children vacationed in California. The trip was also a fact-finding mission—Rogallo had decided to





work on the flexible wing on his own after NACA showed no interest. "I visited 19 aircraft companies and college aeronautics departments," he says, "and came home realizing absolutely no one was thinking along the lines I was. So I started working on the flexible wing concept at my kitchen table."

In July he began with small paper wings that carried beneath them a weight slung on threads, and got some good glides across the living room. Gertrude pitched in, cutting a square out of the kitchen curtains, and by mid-August Rogallo had a tiny prototype. With the

breeze from a large fan set up in the kitchen, Rogallo could test his wings in the form of kites. In the homebuilt wind tunnel, the 15-inch-square of flowered chintz took its shape from the air filling the cloth and conformed exactly to the aerodynamic curve Rogallo had envisioned—without the need for a rigid frame. Soon the whole family could be seen flying larger models of Rogallo's wing on the shores of the Hampton River. Francis and Gertrude applied for a patent in November.

But the world did not beat a path to Rogallo's porch. NACA still viewed his

*Head still in the clouds, Rogallo walks the beaches where he test-flew the kites that led to today's hang gliders.*

flexible wing as a curiosity. "Rog's boss thought he was *simple*," Gertrude says. "They were developing aircraft that flew faster, longer, and farther," Rogallo explains, "which meant larger. A rigid wing is perfect for something that flies and lands fast. I was working on a concept that had to be smaller, slower, and less expensive to be of any value to the average person."



Though the government wasn't interested, Rogallo thought the idea might have some potential in the toy market. In the early 1950s F.A.O. Schwarz and B. Altman stores in Manhattan started stocking something called the Rogallo Flexikite—"Swoop it! Loop it! Maneuver it! World's first flexible heavier-than-air craft" read the package. The 18-inch kite, which sold for \$5, was a refinement of Rogallo's initial design. But in reflecting on the merchandising of the Flexikite—arranged by Peter Hodgson, who hit it big with Silly Putty—Rogallo concludes that it hindered serious interest in the flexible wing: "Toys should copy the real thing, not the other way around." Despite Hodgson's vigorous marketing, the

turning boosters to Earth. Rogallo got the green light to develop his design, in which NASA also saw potential for cargo and personnel drops, emergency wings for vertical-takeoff craft, a gliding re-entry vehicle, and reducing landing speeds of supersonic airplanes.

Rogallo and his staff built bigger wings and smaller wings and tinkered with shape, material, and construction. They stiffened them, searching for a better ratio of lift to drag without adding weight. They built an eight-foot version out of Mylar-covered nylon, launched it from NASA's Wallops Island, Virginia facility to 200,000 feet, then tracked its descent by radar for more than an hour. Other models passed wind tunnel tests at speeds of Mach 4 and higher. In



Flexikite never really caught on.

Then, in 1957, the Soviet Union launched Sputnik—and Rogallo's wing as well. NACA was absorbed into the newly formed National Aeronautics and Space Administration in 1958, and NASA's priority was space flight. As Rogallo later wrote, "Sputnik shocked the aeronautical research community to such an extent that it began to seriously consider unconventional ideas. The flexible wing was one of them." After sitting in on one of Rogallo's presentations in 1959, Wernher von Braun endorsed flexible wings as an ideal method of re-

*The first Rogallo Wing was literally chintzy—Gertrude cut a square from the kitchen curtains (above).*

*When NASA abandoned the flexible wing, backyard inventors adopted it as a cheap, portable hang glider (right).*

1961, working with the Ryan Aeronautical Company, the team wedded a flexible wing to a 180-horsepower engine. The result was the Ryan Flexwing, which developed into the seven-place XV-8A Flexible Wing Aerial Utility Ve-

NASM





hicle—the “Fleep”—built for the Army Transportation Research Command.

By 1963, Rogallo was certain his flexible wing had found a home. He signed a document granting NASA royalty-free use of all his patents. “As a public servant, I had done my work for the government,” he says. “I felt it wasn’t mine to own. Besides, after trying for years to get NACA to deal with me, how could I discourage NASA by demanding money?”

But by the time Rogallo retired in 1970, NASA had cooled on applying the flexible wing to spacecraft—or to anything else. William Sleeman Jr., an aerospace engineer who worked with Rogallo at NASA and its predecessor for 30 years, says the agency found little reason to use flexible wings instead of parachutes for space capsules. “And when the shuttle was developed,”

*The Ryan Flexwing was a bizarre and short-lived adaptation of the Rogallo Wing as an Army transport (left).*

Sleeman says, “it was pretty clear the wing wasn’t going to find its niche as a landing aid.” But by then, a low-altitude application of the flexible wing had caught on with the very people Rogallo had intended to reach in the first place: the public.

Until the appearance of the Rogallo wing, hang gliding had been an arcane sport restricted to those who designed and built fragile, cumbersome, rigid-wing gliders based on the 1890s designs of engineers Otto Lilienthal and Octave Chanute. Rogallo’s work in the 1960s caused a minor revolution among these backyard inventors, who grasped both the mechanics and the spirit of his dream. At the world’s first hang gliding meet, held near Los Angeles in 1971, two Rogallo-winged craft debuted and sparked the imaginations of glider designers everywhere. By the mid-’70s, the sport of hang gliding had soared in popularity. Thousands of aspiring pilots, frustrated by the high cost of powered flight, took to the skies in inexpensive, durable aircraft that could be folded up

and carried on top of their cars.

On the dunes at Jockey’s Ridge, John Harris sums up the reasons for his school’s success. “Rogallo’s wing made all this possible,” he says. When the talk turns to the scope of his accomplishments, Rogallo just shuffles his feet in the sand and smiles. The father of modern hang gliding didn’t get around to soloing a flexible-wing glider until 1965, but he’s made up for lost time with several hundred flights since. Despite a lifelong love of aviation, he never did get a pilot’s license—he didn’t pass the physical exam for his three applications to the armed services in the 1930s.

Perhaps the Fates had a hunch that Rogallo would bring flight to the masses on flexible wings and denied him powered flight in order to focus his vision. How is it that da Vinci could not perfect a flexible wing, yet Rogallo, with a piece of kitchen curtain, could? “There were probably a million ways to make a flexible wing that wouldn’t fly,” he says, like a Zen master. “And, one to make one that would.” —





# Seeing Red

Using high-flying telescopes, astronomers are exploring the infrared universe.

by Stephen P. Maran

If we could see infrared light, we would see a different world. Trees, rocks, dogs, tables—all ordinary objects—would glow. And if we were to look beyond our atmosphere, we would see a different sky.

This otherworldly quality stems from a common phenomenon: any object warmer than absolute zero (−459 degrees Fahrenheit) emits infrared light.

On Earth, we tend to associate infrared light with warm objects: infrared-sensing detectors on aircraft convert the heat of surrounding objects into a visible-light display so the pilot can fly at night; infrared cameras reveal heat leaks in buildings and indicate where insulation should be added.

In space, infrared light is associated largely with “cool” objects—anything with a temperature of 3,000 degrees Kelvin (about 4,900 degrees Fahrenheit) or less. Anything hotter primarily emits light in visible and other wavelengths.

Infrared light interests astronomers because it provides unique perspectives on major components of the universe seen less well, when at all, in other wavelengths. Michael Hauser, who heads the astronomy and solar physics laboratory at NASA’s Goddard Space Flight Center in Greenbelt, Maryland, points to three such components: cool matter, embedded objects, and primordial hot matter.





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Cool matter includes dust particles in space; dying stars, such as red giants; red dwarfs, stars which are much smaller than the sun; and the gases found in the dark dust clouds of the Milky Way and other galaxies.

Embedded objects are found at opposite ends of the stellar life cycle: young protostars shrouded in the dense cocoons of interstellar dust from which they are forming, and protoplanetary nebulae formed from the huge, cool atmospheres red giants cast off as they approach death.

Primordial hot matter, such as young galaxies and the hot gas from the aftermath of the Big Bang—a cosmic explosion thought to mark the origin of the universe—radiates visible light and light with shorter wavelengths. Because the universe has expanded since the explosion, however, that light has been stretched so that it, too, appears to present-day observers in infrared and even longer wavelengths.

By launching infrared telescopes into and above the atmosphere, astronomers today are picking up where our unaided eyes leave off. The sky they have revealed is ablaze with drama: the birth and death of stars, brilliant quasars and fiery supernovae, long-hidden comets leaving glowing trails in their wake, galaxies in collision.

The greatest payoff for infrared astronomy

thus far has been in studies of cosmic dust—microscopic particles of silicate minerals and material rich in carbon, possibly including diamonds—located around stars, in interstellar space, and in distant galaxies.

Although its name may seem to trivialize it, cosmic dust holds some compelling secrets. Astrophysicists believe this dust condenses from stellar winds and the ejecta of exploding stars. In turn, interstellar dust and gas coalesce into stars and planets; the Earth, for example, is made of elements that were created inside the nuclear furnaces of stars that expired over five billion years ago. Dust mapped by its infrared radiation may someday reveal just how the solar system took shape (see “The Curator of Cosmic Dust,” April/May 1987).

Astronomers got their first glimpse of the invisible world of infrared radiation in 1800, when astronomer William Herschel, who was studying sunspots through a telescope, used colored glass filters to protect his eyes from the sun’s glare. While trying to find the most effective set of filters, he noticed that even when he used filters that cut off nearly all light, his eye felt heat. He wondered if the heat was carried by light of a single visible color that passed through the filters. But when Herschel looked through other filter combinations that cut off all visible light, his

*Comet IRAS-Araki-Alcock is painted with rainbow hues in this false-color infrared image. Its nucleus radiates the most infrared light; its tail the least.*



*Astronomer William Herschel discovered infrared light's "invisible solar rays" in 1800 by placing thermometers outside the visible-light spectrum produced by a prism.*

Dale Glasgow



eye still felt hot, as though some solar energy was reaching it.

In a further experiment, Herschel used a prism to break light into its spectrum of colors and placed a thermometer just beyond the spectrum's red end. Other thermometers used as controls were placed parallel to the first, but to the side of the spectrum. As Herschel suspected, the thermometer in line with the spectrum registered far more heat than the controls. "In this case," he concluded, "radiant heat will at least partly, if not chiefly, consist, if I may be permitted the expression, of invisible light."

Remarkable as the concept of invisible light must have seemed, simply detecting the presence of the strong infrared light from the sun was relatively easy for Herschel; after all, solar infrared is sufficiently intense to warm the eye or hand. Observing infrared light from faint stars and from dust in distant galaxies is a much more complex matter.

Many wavelengths of celestial infrared light are absorbed by water vapor in Earth's atmosphere and never reach the surface of the planet. Further, even when the sun sets, the atmosphere continues to shine with infrared light, a consequence of its own heat. Thus, the weak infrared rays from celestial objects that penetrate to ground level are swamped by the atmosphere's general glare. Likewise, the observatory floor, the furniture, the astronomer—even the telescope itself—emit infrared light. Before attempting to study infrared light from afar, astronomers must

cope with infrared light nearby.

To diminish the telescope's own infrared glow, instruments are cooled whenever possible to near absolute zero. In infrared telescopes used on the ground, usually the infrared detectors alone are chilled. But for ultimate sensitivity, a whole telescope should be immersed in a cryogenic vacuum flask—in effect, an ultra-low-temperature Thermos bottle.

As long as the telescope remains on the ground, however, the atmosphere will continue to interfere. At mountaintop observatories this isn't as big a problem, at least when studying sufficiently bright objects at the wavelengths that more easily penetrate the atmosphere. There is less interference by water vapor in the relatively dry air at high altitudes. But the best way to escape this interference is to place the telescope as high above the atmosphere as possible.

Astronomers use "platforms" to elevate their telescopes. From one early platform, the dirigible *Los Angeles*, the infrared spectrum of a solar eclipse was photographed in 1925. Today, platforms take the form of balloons,

### **Inside IRAS**

Though invisible to the human eye, infrared light behaves like visible light, allowing its rays to be gathered in a telescope.

Infrared light entering the 24-inch telescope carried aboard the Infrared Astronomical Satellite (right) reflected off a large primary mirror in the device's center to a secondary mirror above. Together, the mirrors concentrated and focused the light.

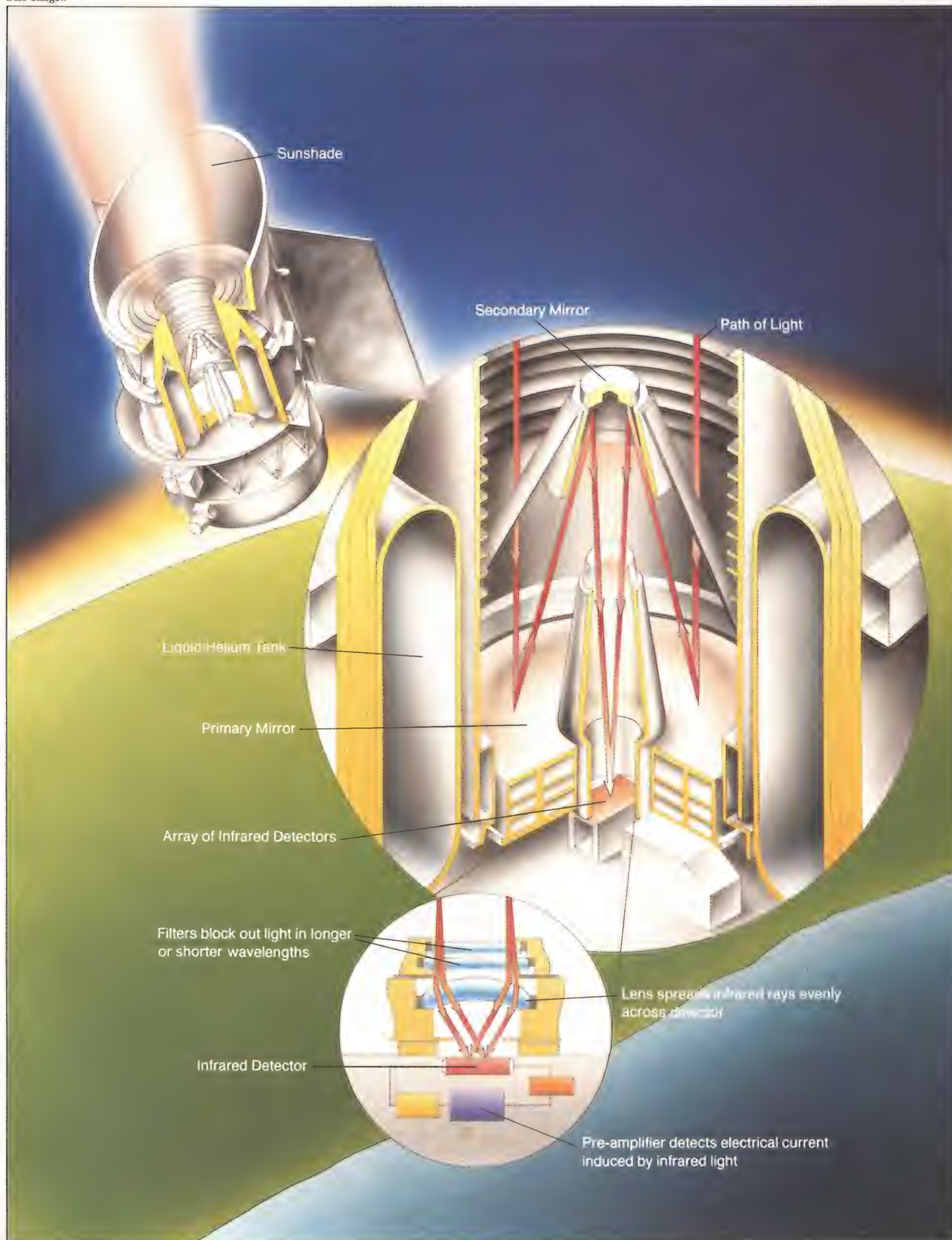
The smaller mirror reflected the light through an opening in the center of the primary mirror onto an array of 62 infrared detectors—together about the size of a playing card—in the base of the instrument.

The detectors, called photoconductive semiconductors, were fitted with filters that made them responsive to one of four infrared-wavelength bands. Infrared light striking these devices dislodged electrons in the semiconductors, producing an electrical current that could be amplified and measured. The stronger the radiation, the stronger the current created. A ground-based computer collected these data and assembled them into a usable form.

Surrounding the telescope, a tank of liquid helium cooled the instrument to just a few degrees above absolute zero to prevent IRAS' own infrared emissions from interfering with its readings.

—Julie Phillips







airplanes, rockets, and satellites, each with its own set of applications.

The most frequently used high-altitude infrared telescope is the 36-incher that rides aboard a converted C-141 military cargo jet known as the Kuiper Airborne Observatory. Initiated by NASA in 1974, the project encompasses over 70 research flights a year.

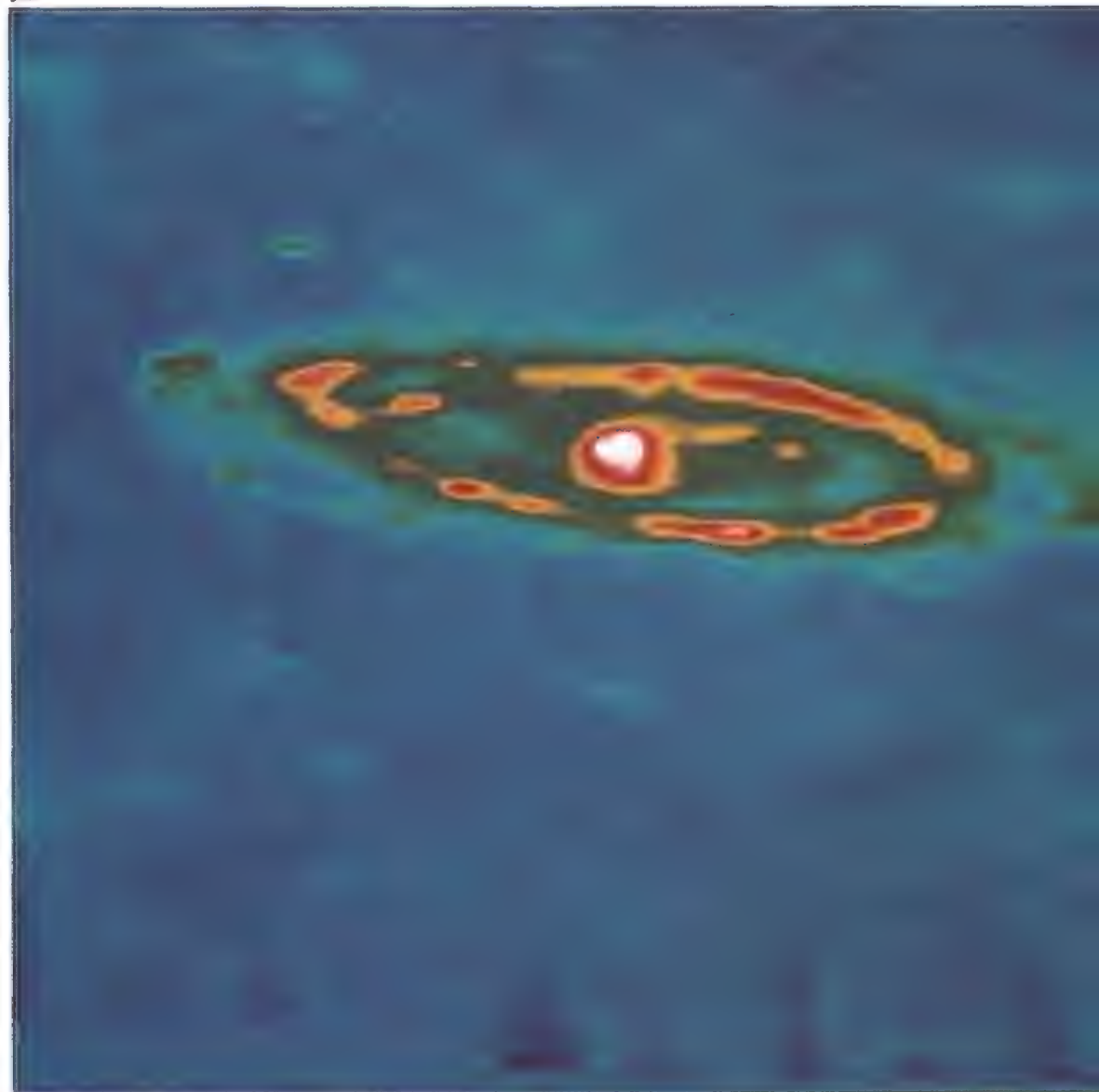
KAO has achieved many noteworthy breakthroughs. It enabled discovery of the rings around Uranus and the presence of water in Halley's Comet, provided information about the composition of most of the planets in our solar system, and revealed the constituents of interstellar dust and gas, data that give new glimpses into the process of star formation.

Unlike telescopes in balloons and rockets, which often crash-land, and those in satellites, which don't return to earth, an airplane observatory has a great advantage: the equipment generally returns unscathed. Another particularly convenient feature is mobility. When Halley's Comet appeared over the Southern Hemisphere in 1986, the KAO crew, based at the Ames Research Center in California, simply flew the observatory to Christchurch, New Zealand, for a series of

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*Beautiful but aloof in visible light, the Andromeda galaxy hides in a swirling cloak of dust and gas (top). Infrared light cuts through the dust, revealing regions of star formation in the red, yellow, and orange areas of a computer-processed image (bottom).*



comet-watching flights. And when a recently discovered supernova blazed into view in the Large Magellanic Cloud, a galaxy appearing low in the Southern Hemisphere, the KAO returned to New Zealand last spring to view it.

A drawback of aircraft observatories is the relatively low altitude the jets attain: typically about 47,000 feet for a KAO flight. At those heights, there is still enough interference from the atmosphere above to limit telescopic performance at some infrared wavelengths.

For long-term studies from higher altitudes, balloons offer an attractive alternative. They readily operate at altitudes much higher than those of jet observatories, so there is less infrared glow from the atmosphere. Balloons can also provide many hours or even days of observing time in a single flight, more than an airplane or rocket. They are much less expensive to operate than rockets or satellites, so they are well suited to initial explorations, before a much more expensive satellite is committed to long-term study.

It wasn't until 1968 that a scientist observed far infrared light from outside the solar system. Far infrared light is that in the longest infrared wavelengths—those most susceptible to absorption by water vapor. Using a one-inch telescope sent aloft on a balloon, William Hoffmann, an astronomer at the University of Arizona, detected infrared light from near the center of the Milky Way. In 1970 Hoffmann expanded on his finding by launching a 12-inch telescope on a balloon to an altitude of about 95,000 feet. There, it scanned the region around the center of the Milky Way in just 18 minutes, making the first detailed measurements of the enormous amounts of infrared energy that radiate from it.

Reaching still higher in space, rockets can carry small infrared telescopes to altitudes above 100 miles—well over atmospheric glow—although they can obtain data for only brief intervals before falling back to Earth. Like balloons, rockets are particularly suited to initial exploration.

During the 1970s, a series of rocket missions, directed by the Air Force Geophysics Laboratory at Hanscom Air Force Base in Massachusetts, found hundreds of infrared sources that glow at wavelengths undetectable from the ground. Some of these sources were then photographed in visible light, since astronomers now knew where to point their telescopes. Among the objects discovered was the Red Rectangle, a nebula that, despite its name, resembles an hourglass in telescopic photos. The Red Rectangle

appears to contain types of complex molecules not definitely identified elsewhere in the sky. Some astronomers speculate that it is a "molecule factory," producing chemical compounds by unusual reactions among its gas and dust.

For all the successes of rocket flights, however, they are very expensive and provide only a few minutes of observation time per launch. For long-term, systematic studies of the cosmos, satellites have proven ideal infrared observatories. Atmospheric absorption is no problem in space, and interference from radiation is largely limited to the sparse amounts emanating from interplanetary dust.

Infrared sensors capable of astronomical observations were in orbit as early as 1972, when scientists from two California aerospace firms used a satellite to detect an "extraordinarily large and brilliant meteor." Subsequently, U.S. Air Force satellites scanning pulsating red giant stars observed changes in infrared brightness. However, the greatest breakthroughs came with the advent of the Infrared Astronomical Satellite, the first civilian satellite for infrared astronomy.

A joint project of the United States, the Netherlands, and Great Britain, IRAS operated for just 10 months after its January 1983 launch, its effectiveness in space limited to the time its load of 125 gallons of liquid helium could keep it sufficiently chilled. Yet IRAS detected a quarter-million infrared sources, ranging from an estimated 20,000 distant galaxies to relatively nearby objects in our solar system.

It surveyed the entire sky at four infrared wavelengths, relaying information at a rate of one million bits a second for 10 minutes a day. This enormous collection of information is stored on magnetic tape at the Infrared Processing and Analysis Center on the campus of the California Institute of Technology in Pasadena. Astronomers are still poring over the data, contrasting it with observations taken at other electromagnetic wavelengths and regularly reporting new findings.

Early in 1987, for example, Caltech astronomer David Sanders announced that the galaxies brightest in the infrared, as measured by IRAS, appear to be involved in massive collisions with neighboring galaxies, setting off enormous bursts of star formation within. Remarkably, quasars—violent and usually rare eruptions at the centers of galaxies—seem to occur with high frequency in these galaxies. Sanders suggests that the collisions cause galactic gas and dust to funnel into the

*The Kuiper Astronomical Observatory, a telescope-toting C-141, keeps an infrared eye on the sky.*

NASA



*A persistent bright spot charted in each of four bands of infrared light from the Large Magellanic Cloud may reveal the hiding place of a massive star.*

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*A disk of particles around Beta Pictoris suggests that the star may have its own planetary system.*

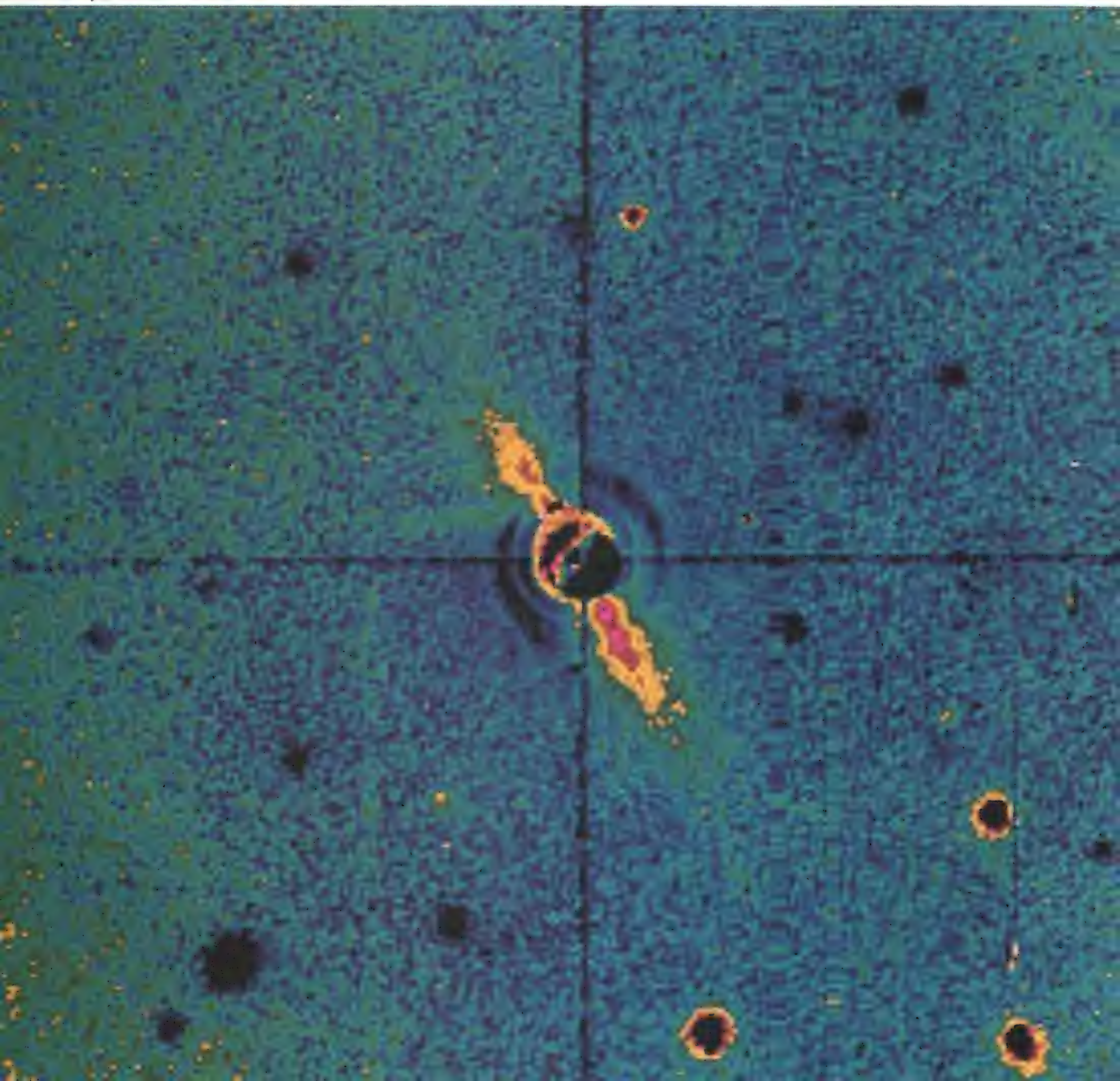
huge black holes thought to exist in the galaxies, fueling the quasars and making them shine.

IRAS also revealed faint bands and trails of dust spread around the solar system, the brightest glows coming from bands along and to the sides of the solar system's central plane. They are so sparse that they reflect almost no visible light, so they don't show up on sky photographs and had previously gone unnoticed.

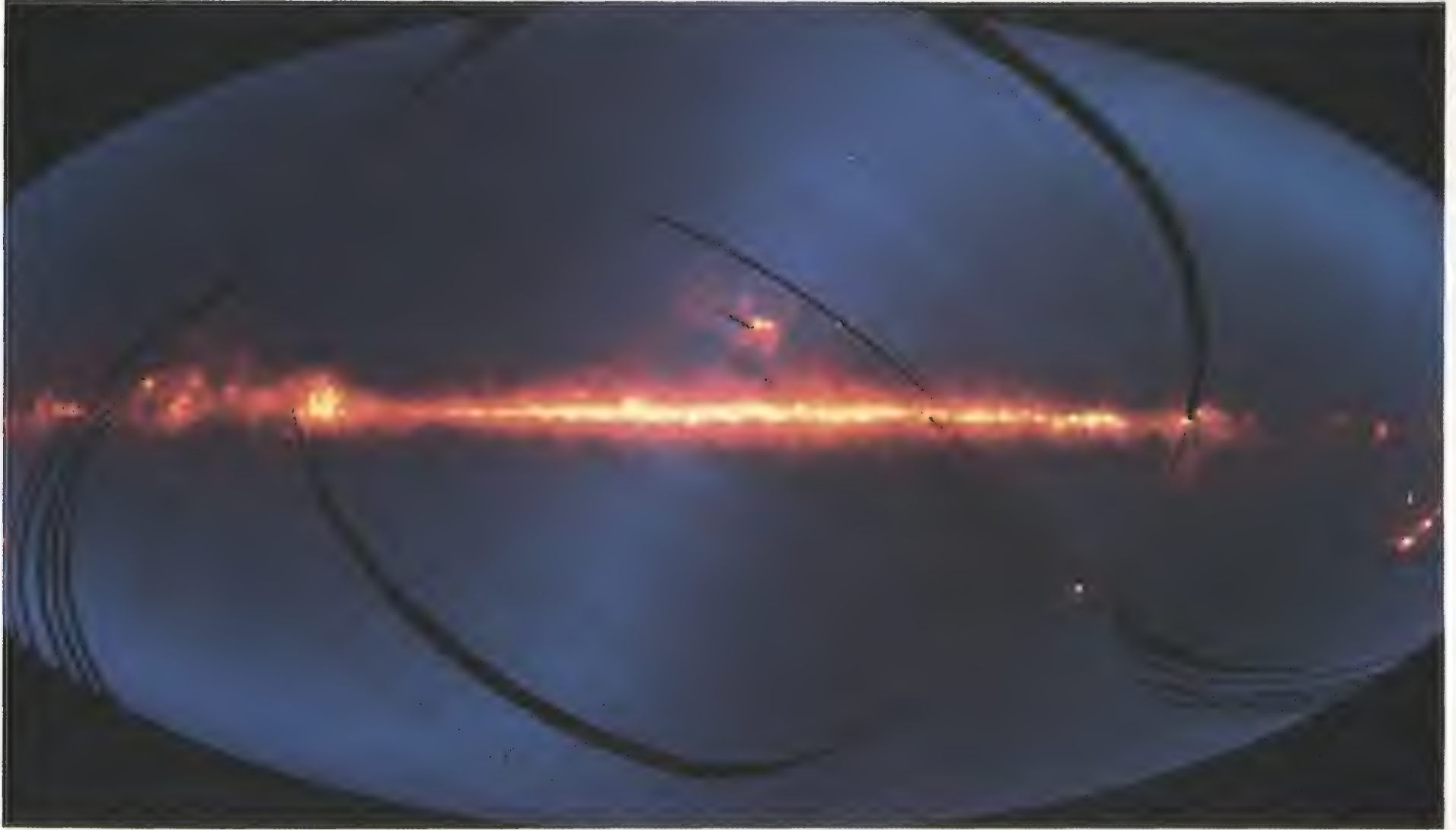
Since the dust's glow is caused by solar heating, astronomers could infer the bands' distance from the sun by measuring the temperature of the dust. The calculated distance places the dust bands smack in the asteroid belt, between the orbits of Mars and Jupiter. Unlike the orbits of most asteroids, these bands extend well above and below the central plane.

Planetary scientists believe colliding asteroids formed these bands. Charles

JPL







Beichman of Caltech's Infrared Processing and Analysis Center has speculated that a single asteroid about seven miles in diameter could yield enough dust to account for them.

IRAS detected still fainter glows from over 100 narrow dust trails, emanations so weak they were near the limit of the satellite's sensors. A few of these trace the orbits of known comets, which leave paths of debris in their wake. The overwhelming majority of the trails, however, do not coincide with the orbits of known comets or other objects, leading scientists to believe that they may reveal the presence of as-yet undiscovered comets. The trails may confirm another theory—that debris-shedding comets are a source of meteor showers in our atmosphere.

The most publicized IRAS finding was the discovery of immense dust disks around several bright stars, notably Vega and Beta Pictoris. The disks, comparable in size to the Oort cloud of comets believed to surround our entire solar system, are flattened clouds of dust particles. Speculation has centered on the possibility that they may represent an early stage in the formation of planetary systems like our solar system. If this proves to be true, these disks would offer important evidence of planetary systems other than our own.

Other important finds will undoubtedly be unearthed from the great collection of IRAS data awaiting analysis. But the next big advance in infrared astronomy is still several years away.

The next major development in aircraft infrared platforms may be the Stratospheric Observatory for Infrared Astronomy, or SOFIA. A joint study of the United States and West Germany, SOFIA will consist of a 118-inch telescope (much larger than the instrument in the KAO, permitting study of fainter and more distant objects) mounted in a Boeing 747.

In 1989, a satellite called the Cosmic Background Explorer will be launched to map and measure the faint infrared glows from diffuse matter in the universe, including the primeval background radiation from the Big Bang. Engineers at the Goddard Space Flight Center are modifying COBE so it can be placed in orbit by a Delta rocket instead of the space shuttle, as originally planned. In the meantime, measurements taken from sounding rockets will help COBE scientists know what to expect.

Another successor to IRAS, the European Space Agency's Infrared Space Observatory, is planned for launch via an Ariane rocket in 1992, with an operational lifetime almost twice that of IRAS. Beyond that, NASA's larger and more powerful Space Infrared Telescope Facility is now under study and planned for launch by a shuttle later in the 1990s. Its science teams have already been selected. With a sensitivity to infrared light a thousand times greater than that of IRAS, this space observatory should keep astronomers seeing red for many years to come. —

*Glowing clouds of gas and dust heated by nearby stars dominate an infrared view of our own galaxy.*



# When Pilots See UFOs

People have been seeing unidentified flying objects in the skies for years. But when the eyewitness is up there with the UFO, is the sighting more difficult to explain?

by Dennis Stacy

*Illustrations by Pierre Mion*

In the late afternoon of November 17, 1986, Japan Air Lines flight 1628, a Boeing 747 with a crew of three, was nearing the end of a trip from Iceland to Anchorage, Alaska. The jet, carrying a cargo of French wine, was flying at 35,000 feet through darkening skies, a red glow from the setting sun lighting one horizon and a full moon rising above the other.

A little after six p.m., pilot Kenju Terauchi noticed white and yellow lights ahead, below, and to the left of his airplane. He could see no details in the darkness and assumed the lights were those of military aircraft. But they continued to pace the 747, prompting first officer Takanori Tamefuji to radio An-

*November 17, 1986: Kenju Terauchi and the crew of Japan Air Lines flight 1628 claim a UFO sighting over Alaska.*









chorage air traffic control and ask if there were other aircraft nearby. Both Anchorage and a nearby military radar station announced that they were picking up weak signals from the 747's vicinity. Terauchi switched on the digital color cockpit weather radar, which is designed to detect weather systems, not other aircraft. His radar screen displayed a green target, a color usually associated with light rain, not the red he would have expected from a reflective solid object.

Because he was sitting in the left-hand seat, Terauchi had the only unobstructed view when the lights, still in front of and below the airplane, began moving erratically, "like two bear cubs playing with each other," as the pilot later wrote in a statement for the Federal Aviation Administration. After several minutes, the lights suddenly darted in front of the 747, "shooting off lights" that lit the cockpit with a warm glow.

As the airplane passed over Eielson Air Force Base, near Fairbanks, the captain said he noticed, looming behind his airplane, the dark silhouette of a gigantic "mothership" larger than two aircraft carriers. He asked air traffic control for permission to take his airplane around in a complete circle and then descend to 31,000 feet. Terauchi said his shadower followed him through both maneuvers.

A United Airlines flight and a military C-130 were both in the area and Anchorage asked the airplanes to change course, intercept the Japanese 747, and confirm the sighting. Both airplanes flew close enough to see JAL 1628's navigation lights, alone in the night sky, before Terauchi reported that the unidentified flying objects had disappeared. The encounter had lasted nearly 50 minutes.

Because it involved an airline pilot and an unidentified flying object that had apparently been captured on radar, the JAL 1628 encounter attracted a great deal of public attention. But UFO reports from pilots—private, military, and airline—are not new to the subject of "ufology." One of the best known cases was a sighting by Idaho businessman and private pilot Kenneth Arnold. Flying his single-engine airplane over Washington's Cascade Mountains on June 24, 1947, Arnold spotted nine silvery, crescent-shaped objects skimming along at high speed near Mt. Rainier. They dipped as they flew, "like a saucer would if you skipped it across the water," Arnold told reporters—and thus "flying saucers" entered the popular vocabulary.

Pilots had reported similar unexplained aerial phenomena before, mainly in the form of the "Foo Fighters" noted by American bomber crews over Europe in World War II. But Arnold's sighting, with its accompanying front-page publicity, struck a jittery, post-Hiroshima nerve in American society and set off a barrage of similar reports. Skeptics believed that every sighting had a prosaic explanation, such as misidentification of stars, planets, or natural atmospheric phenomena. Others thought that there was more to UFOs, that they could even be visitors from other planets.

Following the Arnold incident, the Air Force was given the responsibility of investigating UFO reports from the United States, first as Project Sign (also called Saucer), then Grudge, and finally Blue Book. Usually understaffed and underfunded, the Air Force program functioned more like a public relations office than a scientific investigation, according to the late astronomer J. Allen Hynek. Hynek himself, who served as a

consultant to Project Blue Book from 1948 until it was dissolved in December 1969, gradually changed from a skeptic into a believer.

Not even skeptics can deny the subject's popular appeal. Last March, a Gallup poll found that 88 percent of its respondents had heard of UFOs. Nearly half of those polled believed UFOs were real, not figments of the imagination or misperceived natural phenomena. Nine percent of the adult population claimed to have seen one.

Of these claims, pilot reports are the ones that interest Richard F. Haines, a perceptual psychologist who compiles AIRCAT, a computerized catalog that lists more than 3,000 UFO sightings by aviators over the past 40 years. Chief of the Space Human Factors Office at NASA's Ames Research Center in California, Haines is the author of *Observing UFOs*, a handbook of methodology for accurate observation, and the editor of *UFO Phenomena and the Behavioral Scientist*, a collection of psychologically oriented essays on the subject.

AIRCAT's cases include Blue Book's declassified files as well as some Haines collected and researched personally. Before joining the Space Human Factors Office, his research included interviewing pilots about what they had seen peripherally during takeoffs and landings, data that may one day lead

### **Skeptics R Us**

The Committee for the Scientific Investigation of Claims of the Paranormal (CSICOP) was founded in the spring of 1976, during a meeting of the American Humanist Association in Buffalo, New York. The impetus for the group's formation had been provided a year earlier by the publication of "Objections to Astrology" by Paul Kurtz, professor of philosophy at the State University of New York at Buffalo. The manifesto had been signed by 186 scientists, including 18 Nobel prizewinners, who feared that the public was confusing astronomy with astrology.

Today Kurtz is chairman of the loosely knit international organization, which holds annual meetings and publishes a 25,000-circulation quarterly, *The Skeptical Inquirer*. The journal is devoted to articles debunking psychokinesis, telepathy, clairvoyance, and other psychic claims, the Loch Ness Monster, astrology, and UFOs. CSICOP Fellows include science writer Isaac Asimov, astronomer Carl Sagan, Nobel physicist Murray Gell-Mann, and magician James Randi, recent recipient of a "genius grant" awarded by the MacArthur Foundation.

The UFO subcommittee is led by Philip J. Klass (*UFOs—Identified*, *UFOs Explained*, and *UFOs, the Public Deceived*), James Oberg (*UFOs & Outer Space Mysteries*), and Robert Sheaffer (*The UFO Verdict*). The subcommittee consists of about two dozen members who operate as an informal network, exchanging articles about UFOs for information and comment. Some members make themselves available for local media appearances to counteract what Klass calls "the popular view of UFOs as extraterrestrial spaceships."

"We prefer to have skeptics, of course," says Klass, "but we don't require anyone to take an oath of allegiance saying they don't believe in flying saucers. Basically, we're a mutual education circuit."

—Dennis Stacy



to redesign of airplane cockpits. "I was interviewing pilots anyway," he says, "and fell naturally into the habit of asking them if they'd ever seen anything strange."

Haines concentrated on pilot reports for reasons other than convenience. "They have a unique vantage point simply by being in the air," he says, "if for no other reason than if the phenomenon is between your eyes and the ground, you can calculate the slant range, and you're establishing an absolute maximum distance the object could be away. You can't do that with the object against the sky background."

"Pilots also have available to them a variety of electromagnetic sensors of various kinds onboard the aircraft itself, which can possibly record some manifestations of the phenomenon, such as electromagnetic frequency and even energy content," he says. "They can control the location of their plane so that they can maneuver to gain the best vantage point, under some conditions."

"Finally," says Haines, "they represent a very stable personality type with a high degree of training, motivation, and selection. If a pilot comes forward with a strange tale, I give him a lot of careful concentration because he's putting his reputation on the line and maybe his job. He's had to have thought the details out in his mind already, and perhaps eliminated a number of explanations before going public."

He's also likely to request anonymity. Kenneth Arnold, tired of the publicity following his sighting, later commented, "If I ever see again a phenomenon of that sort, even if it's a 10-story building, I won't say a word about it." The feeling was echoed even in the Air Force. When Blue Book's predecessor, Project Grudge, conducted an informal survey of Air Force pilots in the late 1940s, one respondent said, "If a spaceship was flying wingtip-to-wingtip formation with me, I would not report it."

The UFO phenomenon got its tabloid reputation at least in part because of the saucer-busting of active UFO skeptics. Foremost is the UFO panel of CSICOP, the Committee for the Scientific Investigation of Claims of the Paranormal (see "Skeptics R Us," previous page). Led by Philip J. Klass, contributing avionics editor of *Aviation Week and Space Technology*, James Oberg, an aerospace writer and a manned space operations specialist, and Robert Sheaffer, a Silicon Valley computer systems analyst, CSICOP exposes hoaxes and uncovers explanations of UFO sightings.

Sheaffer doesn't agree that pilots are superior UFO observers. "The idea of pilots as super witnesses just doesn't hold," he says. "The last I heard they were human like the rest of us, and still subject to all the concerns and errors of human psychology and perception. In fact, they're apt to be less worried about how bright an object is, or its angular elevation, than in keeping their plane in the air. Anyone surprised by a very brief and unexpected event is not likely to report it accurately."

Haines agrees that normal perception isn't infallible. Very bright objects, for example, can appear to be much nearer than they actually are. Autokinetic, or self-generated, movement of the eyeball can make distant objects like stars and planets

*June 24, 1947: Private pilot Kenneth Arnold's report of an encounter gives birth to the term "flying saucers."*





appear to move. "Also, when you're flying in a sunny, clear blue atmosphere," Haines says, "sometimes the eye can focus inaccurately, so that you're not focusing at infinity anymore, but maybe only one or two meters in front of the cockpit."

Because the way we see external events depends on the body's perception of itself in space, acceleration and inertial forces that disrupt the inner ear's delicate sense of balance can also lead to optical illusions. Still, Haines contends that many induced illusions are short-lived and cannot account for the majority of AIRCAT's cases. "If a pilot describes a disk-shaped airform with no visible means of propulsion pacing his right wing for 30 minutes, doing everything he's doing—and I have plenty of cases like that—then that's not an optical illusion, it's not a bird or balloon or meteor, it's not any of those prosaic explanations," Haines says. "We don't know what it is necessarily, but we know quite clearly what it isn't."

One sensational pilot-and-UFO case almost certainly had a prosaic explanation. On the afternoon of January 7, 1948, people near Godman Air Force Base at Fort Knox, Kentucky, reported an object in the sky that looked like "an ice cream cone topped with red." Captain Thomas F. Mantell, flying in command of a ferry flight of four National Guard F-51 Mustangs (P-51s had been redesignated F-51s the previous year), was asked to investigate. None of the fighters was equipped with oxygen, and after three dropped out of the chase Mantell continued alone. "It's directly ahead and above and still moving at about half my speed," he radioed. "The thing looks metallic and of tremendous size. I'm going up to 20,000 feet, and if I'm no closer I'll abandon the chase." A few minutes later Mantell's airplane crashed, earning him dubious distinction as the world's first "UFO martyr."

Project Blue Book proposed that Mantell succumbed to hypoxia, or oxygen starvation, and crashed while chasing the planet Venus, but later evidence indicates he was pursuing a top-secret, high-atmosphere Skyhook balloon. The balloons, designed for upper-atmosphere research, were later used by the CIA for surveillance. At altitudes of 70,000 feet or more, the translucent plastic balloons would often be swept rapidly along by the jet stream.

Mantell wasn't the last pilot to die while pursuing, or being pursued by, an alleged UFO. At 6:19 p.m. on Saturday, October 21, 1978, Frederick Valentich of Melbourne, Australia, took off from Moorabbin Airport aboard a rented Cessna 182, bound for nearby King Island. He planned to pick up a load of crayfish for his fellow officers at the Air Training Corps, where he was a flight instructor. An experienced daytime pilot with an unrestricted license and instrument rating, Valentich, 20, was relatively inexperienced at night flying. He was also a UFO enthusiast who, his father said later, had claimed a UFO sighting 10 months before his disappearance.

Out of Melbourne, Valentich paralleled Cape Otway before heading over open water for King Island, where he was scheduled to land at 7:28. At 7:06 he radioed Melbourne Flight Service, asking, "Is there any known traffic in my area below 5,000 feet? Seems to be a large aircraft." Ground control asked what kind. "I cannot confirm," Valentich replied. "It has four bright lights that appear to be landing lights . . . [and] has just passed over me about 1,000 feet above . . . at the speed it's traveling are there any RAAF [Royal Australian Air Force]

*January 7, 1948: Captain Thomas Mantell crashes after chasing a UFO later identified as a Skyhook balloon.*

aircraft in the vicinity?"

"Negative," answered Melbourne. "Confirm you cannot identify aircraft?" Valentich replied in the affirmative, adding three minutes later, "It's not an aircraft, it's . . ." At that point there was a brief break in the recorded transmission that was later released to the Australian press.

"It is flying past," Valentich continued. "It has a long shape. Cannot identify more than that . . . coming for me now. It seems to be stationary. I'm orbiting and the thing is orbiting on top of me. It has a green light and sort of metallic light on the outside." The pilot then informed air traffic controllers that the object had vanished. At 7:12 he was back on the air, reporting his "engine is rough-idling and coughing." Ground control asked what his intentions were; Valentich said, "Proceeding King Island. Unknown aircraft now hovering on top of me." His radio transmission ended in a jarring, 17-second metallic noise. Neither pilot nor airplane has been seen or heard from since. Some have attempted to explain away the incident as a hoax or a suicide, while others have suggested that the inexperienced night pilot, overcome by vertigo, may have turned upside down and seen the reflections of his own lights before the engine of his Cessna failed.

Haines has published a book about the Valentich incident, *Melbourne Episode: Case Study of a Missing Pilot*, and he is in the midst of another compiling all of AIRCAT's cases. Most are variations on ufology's two major themes: daylight disks and nocturnal lights. The first involves what appear to be objects in the shape of disks, spheres, or elliptical forms. Nocturnal lights normally appear as single, continuously visible white light sources. Sometimes the lights are also detected by ground or airborne radar and, less frequently, accompanied by radio static and brief engine interruption, such as that experienced by Valentich. Most sightings involve two or more witnesses and last slightly more than five minutes, long enough in most cases, says Haines, to eliminate a number of explanations, such as meteors and balloons.

According to Haines, UFO reports made by aircrew and pilots closely parallel those of observers on the ground. "When I started," he says, "the idea was to see whether or not pilots were reporting the same phenomenon. I think AIRCAT pretty well establishes they are."

One case from the AIRCAT files involved a pilot—call him Captain Gray—who had logged more than 21,000 hours in a 31-year career. On July 4, 1981, he was piloting a passenger flight in a Lockheed L-1011 Tristar, cruising on automatic pilot at 37,000 feet. The flight was bound from San Francisco to New York's Kennedy Airport, approaching the eastern shore of Lake Michigan. The lake below was obscured by clouds, but ahead and above the sky was clear.

Suddenly, from ahead and to the left of the aircraft, a silvery disk "splashed into view full size . . . like the atmosphere opened up," Gray said later. He leaned forward, blurting out, "What's that?"

Appearing at first like a sombrero viewed from the top, the object rolled as it approached the airplane along an arc that













*July 4, 1981: An L-1011 pilot is surprised by a UFO during a six-second encounter over Lake Michigan.*

carried it toward and then abruptly away from the L-1011. From the side, the disk appeared ten times wider than it was thick, with six evenly spaced, jet black portholes along its edge. A bright splash of sunlight flared off the top left end of the object. As it disappeared, seemingly in a shallow climb, Gray noticed what looked like the dark smudge of a contrail.

"Did you just see anything?" Gray asked his first officer. "Yes," he replied, "a very bright light flash." The flight engineer, his view blocked, had seen nothing.

The overriding question for ufologists is whether a sighting like Captain Gray's is a natural phenomenon or an object that displays evidence of intelligence. "As a scientist I have to be cautious," says Haines. "But when AIRCAT is made public, I think the technical-minded can read between the lines."

Skeptics would disagree. "I think there are more than enough ordinary stimuli floating around to create the UFO phenomena, the UFO social event, of the past 40 years," says CSICOP's James Oberg. "Because of imperfections in human memory and perception, coincidences, and so on, there'll always be a small residue of unsolved sightings. A small percent of airplane crashes, murders, and missing-person cases don't get solved either. But you don't have to invoke alien airplane saboteurs, murderers, or kidnappers to explain them."

Haines retorts that Captain Gray was a skeptic before his own UFO confrontation. But afterwards, "there was no doubt in his mind whatsoever" that what he had seen was an extraterrestrial spacecraft.

Captain Terauchi of JAL flight 1628 was equally convinced that he had encountered an extraterrestrial craft in the skies above Alaska. Skeptics are not so sure, citing the fact that Terauchi had reported seeing UFOs on two previous occasions—and would report yet another sighting the following January, again over Alaska. (He would later explain his second Alaskan encounter as city lights reflecting off ice crystals in clouds.) CSICOP's Philip Klass thinks that ice crystals in clouds played a significant role in the November encounter. He theorizes that moonlight reflecting off the clouds accounts for the initial sighting, and that when the crew later saw Mars and Jupiter, bright in the autumn sky, they assumed the planets were lights from the original UFO. The signal on the onboard radar, Klass believes, could have been reflected by the same ice crystals (although ice crystals, unlike rain droplets, are very poor reflectors of radar energy). The FAA analyzed the ground radar images and concluded that they had been uncorrelated radar signals, a common phenomenon that occurs when a radar beam bounced back from an airplane to a ground station doesn't match up with a separate signal sent by the airplane's transponder.

That pilots, as well as ground observers, have seen something in the skies is undeniable. The question of what they have seen has yet to be satisfactorily resolved. Maybe it never will be. It may even be irrelevant. As Jacques Vallée, who has written several books on the subject, once said, "It no longer matters whether UFOs are real or not, because people *behave* as if they were, anyway." ➔



### Hang Time

It is widely believed that earthbound human beings, no matter how high they jump, cannot fly without the aid of contrivances, such as hot-air balloons or 747s. They certainly cannot suspend themselves unassisted in midair like oversized hummingbirds. Even a human cannonball ascends and descends on a fixed trajectory and cannot tarry in flight, Earth's gravity being unbeatable anywhere within a hundred miles or so of the ground.

Ah, but as true basketball fans appreciate, there are certain low-altitude achievers who, equipped only with high-top sneakers, may be seen in action no farther away than the nearest schoolyard or the local gym. Rising from skin-searing cement or a sweat-streaked hardwood court, amid the thumps and squeaks of one-on-one combat, some gifted athletes are able to defy, if only for a sliver of a second, the immutable law that states: What goes up must come down, and with no delay.

Impossible, huh? Then explain the phenomenon known to basketball junkies as "hang time."

Hang time is, simply, the ability to stay in the air. The term is universally recognized

but loosely defined by people in and around the game, and it is not something that players, coaches, scouts, and fans normally measure with stopwatch precision. But they know it when they see it, even if some of them shake their heads and don't quite believe it.

One afternoon a few years back, I watched the Georgetown University team at a pre-season practice game under the coaching of John Thompson. This Washington, D.C. team had reached the National Collegiate Athletic Association championship contest at the close of the previous season, so the players on the court that lazy late-summer day were quite a bit above average in talent and intensity.

Anthony Jones, a young player built like a lightning bolt (and now a pro with the San Antonio Spurs), raced down the right side of the court on a fast break and went airborne to catch a long Alley Oop pass. The pass was supposed to end its arc above

*In Olympic gymnastic competitions, more time aloft can translate into extra points for an athlete.*

the hoop so that Jones could catch the ball and stuff it in the net.

But the pass was off target, behind Jones and to his right. So he twisted in midair, caught the ball high to his right, and, while seeming to jam on a set of brakes, switched the ball to his left hand. Then, still airborne, he sailed past the right side of the backboard as his trailing left hand banked the ball against the glass and into the basket.

Just two points in a practice game, but a stunning demonstration of midair maneuvering. And leaving aside the aerobatics, the mystifying aspect of such feats is that some ballplayers seem able to grasp extra time in which to perform them. In this case, Jones' momentum should have carried him far beyond the point at which he could even catch the wayward pass, much less find time to make the field goal.

I spoke to a sampling of sports authorities, some of whom had congregated at a school gym to scout a boys' basketball tournament. The diversity of their opinions almost makes for a toss-up.

"It's not an illusion," says Kevin Porter, a former National Basketball Association point guard and college coach. "You look at a kid and see how he hangs in the air, and what he does when he gets there." Porter motions to Eddie Jordan, a high-soaring ex-NBA player who is now an assistant coach at Boston College.

"It's an optical illusion," maintains Jordan, who believes that most players simply jump too soon or too late, so the player who times his jump correctly seems to have gained extra time on his opponent.

Illusion or not, few players are blessed with the wherewithal even to seem to have it. Because of its rarity, "it's something you notice," says Georgia Institute of Technology coach Bobby Cremins, adding, "I don't think you can teach it."

"Gravity being what it is, I think it is more a case of these people are able to put a lot more energy into their leap and traverse a greater amount of distance before they come down," says Gary Miller, a biomechanics researcher at the orthopedic surgery department at the

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University of Florida. Whatever it is, Miller says, "the Gators need some players like that."

"I don't think they actually 'hang' up there," says talking sports encyclopedia Ken Beatrice, who hosts a call-in show at radio station WMAL in Washington, D.C. "I think it is just great body control, even up in the air."

Marty Blake, the NBA's director of scouting, believes in hang time but discounts its relationship to overall ability. "Larry Bird doesn't have a vertical jump and he's the best in the game," Blake points out.

Hang time has nothing to do with how high a player jumps, any more than a player's jumping ability is necessarily a measure of how well he or she plays the game. Among the NBA names often associated with exceptional hang time are Michael Jordan of the Chicago Bulls and the legendary Julius Erving of the Philadelphia 76ers, who retired at the close of the 1986-87 season.

Another player who has the gift is Tyrone Shaw, a 6-foot, 7-inch senior at West Virginia University and a star in one of Washington's summer leagues. To Shaw, hang time is no mystery. "The higher you jump, the more time you have in the air," he says. When a defender goes up against him, the outcome is predictable: "I think he'll go down before me," says Shaw. (He might also bump the defender to hasten his descent, he adds.) Shaw believes some players seem to be born with this ability, but he tries to extend his hang time by working out with leg weights and running in boots to put more power into his jump. His vertical jump, from a stationary position, is now about 30 inches, and he wants to up it to 40, near the altitude of top players in the NBA.

But there's more to it than the timing of the jump, the power in the leap, and the degree of body control. Charles Dillman, director of sports science for the U.S. Olympic Committee at Colorado Springs, Colorado, says that what a player does after leaving the floor can make it look like he's hanging in the air, even though he's not. For elaboration he refers me to James G. Hay, director of the exercise science department's biomechanics laboratory at the University of Iowa.

Hay, intrigued by the hang time phenomenon, got to wondering some years back if "this hanging-in-the-air business is something that's real or an optical illusion," and he conducted a study using eight basketball players, cameras, timing devices, and computer analyses. Hay and colleague Robert D. Bishop reported their findings in a 1979 article in the journal *Medicine and*

Enrico Ferorelli/DOT



#### Science in Sports.

"The conclusion we came to is that it's real within a certain definition," Hay explains. "There's no violation of physics involved here," because the body's center of gravity has to go up and come down on a fixed parabolic curve, which is determined by the velocity at takeoff. Nothing can change the up-and-down curve of the center of gravity except contact with another

*To attain hang time, getting into the air is only half the act; staying there takes technique.*

ballplayer, he says. But parts of the body can act independently of the center of gravity during the jump, and thus parts of the body can prolong their stay in space even if the whole body can't.

What this research showed was that a player's head, neck, and trunk can remain stationary (for about an extra 0.2 second) if, at the top of the jump, the player flexes his legs and extends his arms.

Hay and Bishop's tests demonstrated that hang time—or more specifically, the period in which the head stays in the same horizontal plane—can be extended by these movements, thus giving the player a longer look at the basket from his or her shooting position.

Hay tells me that hang time is not exclusively conferred on basketball players. High jumpers, volleyball players, and ballet dancers also appear to gain extra time aloft with proper jumping technique. Some of these performers—ballet star Mikhail Baryshnikov, for example—may seem to be better jumpers than they are, Hay suggests, because they have learned how to display hang time.

To check it out, I took in a performance of Tchaikovsky's *The Sleeping Beauty* by the American Ballet Theatre to see if top-rated dancers indeed hang in the air as basketball players do. Maybe the blame goes to the composer, the choreographer, the muggy weather, or the viewer's untrained eye, but the dancers didn't seem to show any hang time. They pranced, spun, and jumped—but landed immediately after takeoff.

If hang time were so easy to master that every performer could do it, says Hay, a sport like basketball would be in trouble, because the players would shoot too much. To this Georgetown coach Thompson replies: "If you find out how to make people stay in the air longer, you come see me." He adds, however, that while coaches are intrigued by claims that certain muscle fibers provide extra "quick start" jumping power and that these fibers can be strengthened through special exercises, they are wary of risking injury to players or upsetting their natural movements by prescribing intensive training programs.

There is some scientific evidence that hang time is real. And any reader who has ever dreamed of floating in air may want to experiment with the techniques Hay recommends. The rest of us will have to settle for hot-air balloons and 747s.

—Richard Corrigan





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## Reviews&Previews

**Straight on Till Morning** by Mary S. Lovell. St. Martin's Press, 1987. 408 pp., b&w photos, \$16.95 (hardbound).

Beryl Markham: racehorse trainer, African bush pilot, Atlantic flier, gifted writer, stunning beauty. With such credentials it is little wonder she was the darling of London and Kenyan high society in the 1930s and '40s. But today, when public figures past and present are subject to intense scrutiny, Mary Lovell delves into Markham's glamorous life and presents an almost pitiable figure who never in her 83 years seemed truly content.

Markham was raised in Njoro, East Africa, by her father, whom she idolized. She handled racehorses and airplanes equally well, but handled relationships with both sexes like hot potatoes. She had no interest in her companions beyond what they could do for her, and went through three husbands and numerous lovers looking for someone to live up to her father's image. Her liaisons included England's Prince Henry, Denys Finch Hatton (whose affair with Karen Blixen is detailed in *Out of Africa*), French author Antoine de Saint-Exupéry, and conductor Leopold Stokowski.

Her greatest feat was her 1936 Atlantic crossing, the first nonstop transatlantic solo by a woman, which she made in a single-engine Vega Gull. The flight ended short of New York in a Nova Scotia bog but landed Markham in a flurry of publicity and parties. The hoped-for offers of jobs in aviation never came through, though, and she abandoned flying, choosing her racehorses in Africa as her life's work.

While married to journalist Raoul Schumacher, she wrote her memoirs—somewhat embroidered for the sake of the story line—and published them in 1942 as *West with the Night*. Ernest Hemingway, who once called Markham a “high-grade bitch” (reportedly for spurning his advances), raved over the book, writing to a friend that “this girl can write rings around all of us.” After lapsing into obscurity, the book was republished in 1983 and remains a best-seller today. Lovell attempts to end



the current controversy over its authorship by insisting that Markham, inspired by her lover de Saint-Exupéry, did indeed write it, with Schumacher serving only as editor.

Despite the promise she showed in writing—she also published a handful of short stories in *Collier's* and other magazines, and Lovell has recently compiled them in North Point Press' *The Splendid Outcast*—that, too, was abandoned. Markham spent her later years alone, teetering on the edge of poverty. In 1986, just months before Markham died, Lovell spent several weeks with her in her home in Nairobi, poring over scrapbooks, calling on her fading memories, and sorting gossip from truth. Lovell's portrait of the gorgeous blonde pilot and horsewoman is well researched and well written. Those who enjoy sketches of life in the fast lane will love it; those who prefer their idols untarnished should not go beyond *West with the Night*.

Patricia Trenner, Departments Editor

**The Ravens: The Men Who Flew in America's Secret War in Laos** by Christopher Robbins. Crown Publishers, 1987. 420 pp., b&w photos, \$19.95 (hardbound).

A forward air controller—FAC—is a fighter pilot who hangs over enemy territory in a spotter plane, marking targets for faster craft to hit with bombs, rockets, and cannon fire. “Raven” was the call sign of the 196 FACs who volunteered to fight the secret war in Laos. “They were always men who enjoyed a maximum of flying and a minimum of administration,” Christopher Robbins says of them, “and they tended to be the very best pilots.” And, by necessity, the bravest.

The Laotian war was the mirror image of the one in Vietnam: when the official war went smoothly, the secret war was kept on short rations. But when the weather was bad over South Vietnam, or when politics dictated a halt to the U.S. bombing of North Vietnam, Laos got so much “air” that the Ravens were obliged to stack fighter-bombers over targets like passenger jets waiting to get into La Guardia.

In Laos, unlike Vietnam, the United States supported the guerrillas, in this case 30,000 lightly armed Hmong tribesmen who battled a North Vietnamese army equipped with tanks and heavy artillery. During the dry season, the NVA pushed the Hmong out of their homeland, the beautiful and strategic Plain of Jars. In the rainy season, using commando tactics, the Hmong took it back.

The only thing the tribesmen had going for them was U.S.-supplied airborne artillery. To mark targets, the Ravens flew high-wing Cessna O-1 Bird Dogs dating back to 1950. In their vulnerable antiques, the Ravens performed miracles of endurance, ingenuity, and audacity.

Robbins supplies memorable anecdotes about the Ravens' stamina. For example, when Mike Cavanaugh picked up a refurbished airplane at Thailand's Udorn airfield, he was told to bring it back in four weeks for its 100-hour check. He returned it 10 days later—stinking of vomit, shot full



# ABC

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Florence Cassen Mayers

**The National Air and Space Museum ABC** by Florence Cassen Mayers. Harry N. Abrams, 1987. 32 pp., \$9.95, (hardbound).

This whimsical alphabet book features Museum artifacts. Its format may be hard on small hands.

On a day so awful even propeller-driven fighters were grounded, six Ravens went to the aid of a Hmong outpost. Under a 100-foot ceiling, they jockeyed their Bird Dogs as gun platforms, breaking the siege with grenades and small-arms fire—and afterward were threatened with court-martial for disobeying standing orders against carrying ordnance.

In the end, both the war and the secrecy were lost. Having dropped 1.6 million tons of bombs on Laos (more than fell on Germany in World War II), the United States walked away. North Vietnam conquered Laos within a year, and the Hmong people were forced to emigrate or face extermination.

Approximately 200 Americans, including 24 Ravens, were killed in action during this country's eight-year intervention in Laos. The others, on coming home, did not find the welcome they expected. Most were eventually purged from the U.S. Air Force because, as one ex-Raven was told, "we don't want these habits or these memories in our fighter force." Returning FACs were advised that their uniforms might offend or even enrage some civilians. At his high school reunion, Karl Polifka met a classmate who had become an anti-war activist and who assured him that their differences no longer mattered—all was forgiven and forgotten. "It is certainly not forgiven," Polifka told her, "and will never be forgotten."

Nor need it be, thanks to *The Ravens*, a book that is both moving and informative, although it has weaknesses. By setting himself the task of explaining an unfamiliar war while also telling the personal story of the FACs, Robbins has produced a sometimes confusing double narrative with what seem to be arbitrary omissions. More significantly, the documentation is thin, consisting mostly of interviews conducted by the author, which are impossible to verify independently. Robbins' *Air America*, about the CIA's covert-warfare airline, was faulted by Air America officers and historians for factual errors and mythologizing; *The Ravens* may be similarly flawed.

But even if it is, we are not likely to read a better account of the secret war for some time to come: the official history, Major Victor Anthony's unpublished *The War in Northern Laos*, is so thoroughly classified that we will probably never get to read it.

*Daniel Ford was a reporter in South Vietnam, where he met some of the fighter pilots who later served as FACs in Laos. He is writing a history of America's first clandestine air force, the Flying Tigers of 1941-1942.*

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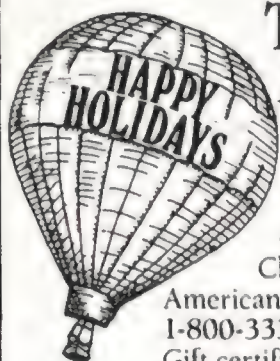
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**Before Lift-Off: The Making of a  
Space Shuttle Crew by Henry S.F.  
Cooper Jr. The Johns Hopkins University  
Press, 1987. 270 pp., b&w photos, \$18.50  
(hardbound).**

"The line between the real world and the sim world is very thin," writes Henry S.F. Cooper Jr. He backs up his assertion with a highly readable account of the training of a shuttle crew, focusing on the hundreds of flight simulations, or "sims," that take place on the ground in the months before a mission. These sims feature as many "malfs" (malfunctions) and other simulated problems as the crew's instructors can get away with, so both the astronauts and ground personnel can become intimately familiar with the shuttle's capabilities, the procedures to follow in case of trouble, and the priorities to be followed if only some of the mission's objectives can be met.

Cooper, who has written about the space program for the *New Yorker* for 20 years and has published several books on space, is

well prepared to cover astronaut training. He also has a gift for capturing the spirit of the enterprise, as shown in his description of a meeting in which instructors orchestrated a script for a lengthy and elaborate sim: "The timeline . . . was relatively empty looking, resembling blank sheets of music, and it would be the purpose of the meeting to fill in the timeline with a vast number of nits, malfs, anomalies, and glitches, in quantities resembling a scherzo passage in a Gilbert and Sullivan operetta. There would be harmonies and dissonances, with one theme leading into another. There would be the tinkling of minor nits and the crashing of major malfs."

By the book's final pages, when the shuttle lifts off on October 1984's mission 41-G, you imagine you understand how the astronauts and their trainers feel to have reached the climax of an intricate and arduous process.

*Katie Janssen, Associate Editor*

**The Holy Land: Israel from the Air  
by Baron Wolman. Chronicle Books,  
1987. 144 pp., color photographs, \$35.00  
(hardbound).**

Baron Wolman's aerial perspective offers viewers a panorama of Israel, from the sun-bleached ruins of ancient kingdoms to the colorful collage created by sunbathers at the beach, from the jarring geometry of resort architecture

to the sensuality of time-worn Mediterranean hills. His photographs of Jerusalem bring home the city's solemn density, as in this image of the Dome of the Rock, built on ground holy to Jews, Christians, and Moslems alike. The book includes maps, handy for those unfamiliar with the territory. Wolman's commentary is intelligent, providing a useful context for his photographs without distracting from them.





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**Sojourn in Tucson** April 3-10 or April 25-May 2: From your base at the Arizona Inn, settle in for a week-long overview of Arizona's cultural and natural history.

**Alabama** April 9-16: Discover the South's rich cultural heritage as interpreted by scholars, craftsmen and musicians.

**Southwest Indians** April 29-May 8: In this in-depth look at Southwest Indian cultures, travel to Phoenix, Chaco Canyon and Canyon de Chelly. Meet craftsmen, visit museums and private collections.

**Spring Gardens** May 8-15: Enjoy a variety of gardens in Washington, D.C. and the Delaware Valley including the Enid A. Haupt Garden, Longwood and Winterthur.

**San Francisco** May 14-21 or September 3-10: Experience the ambiance and charm of this popular destination while visiting sites beyond the usual tourist route. An overview of the city's history, ethnic diversity and future prospects.

**Atlanta Quest** May 20-June 4: Retrace America's history from Florida to Maine aboard the *Illiria*. This unique voyage begins in New Orleans with stops at St. Augustine, Savannah, Charleston, Providence, and many other historic ports and concludes at Campobello Island in New Brunswick.

**Sanibel** May 22-28 or May 29-June 4: Tidal walks and canoe journeys take you in search of alligators, roseate spoonbills and loggerhead turtles in this estuarine environment on Florida's Gulf Coast.

**Wild California: Big Sur to Yosemite** June 8-17 or September 9-18: Sea breezes, ancient redwoods, lush mountain meadows await you on this natural history tour to California's most spectacular parks and sites.

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**Thailand and Burma** January 9-29: In Asia's most exotic countries, explore colorful cities, remote villages and archaeological sites.

**Mesoamerican Study Program** January and February: Choose from three itineraries—Yucatán Adventure, Zapotec and Maya Mexico, Guatemala Adventure. Explore archaeological treasures, natural beauty.

**Tanzania-Kenya Wildlife Safari** January 18-February 7: A unique wildlife excursion featuring the best of East Africa.

**India Wildlife Safari** January 22-February 17: Travel by elephant and jeep to observe rare species of birds and animals in India and southern Nepal.

**Siberian Winter Odyssey** January 24-February 6: A thrilling winter exploration awaits you—dash through majestic country side in a troika, ride the Trans-Siberian Express, visit Moscow and Leningrad.

**A Hike in New Zealand** February 14-March 5: From Lake Te Anau to Milford Sound, discover wildflowers, crystalline lakes and snowcapped peaks on the Milford Track.

**Australia-New Zealand** February 21-March 15: An intriguing introduction to the natural history and culture of the lands "down under."

**Costa Rica** March 11-24: An expedition for nature enthusiasts to see flora, birds, and other wildlife in the American tropics.

**Chile-Bolivia Voyage** March 24-April 6: Aboard the *Illiria* travel up the coast of Chile. Explore archaeological finds, crystal clear lakes, and the magnificent Atacama desert.

**Caribbean Voyage** March 28-April 4: Sail from the Panama Canal to Curacao aboard the four-masted, square-rigged barque *Sea Cloud*. Calls include the San Blas Islands, Cartagena, Aruba.

**Berlin** April 14-29: Experience the two sides of Berlin, East and West, named Cultural Capital of Europe for 1988.

**May in Greece** May 6-21: Marvel at classical wonders and beautiful landscape from Athens to Thessaloniki.

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## Credits(& Further Reading

**Escape and Rescue.** Edwards Park never had to bail out of an airplane, but during World War II he once landed a P-39 riddled with 144 bullet holes.

**Ski Lift.** Stephan Wilkinson, who sometimes moves faster on the ground than he does in the air, contributes "Great Drives," a series of exotic-car road-test reports, to *Condé Nast's Traveler*.

**Destination Schiphol.** Ian Keown, a widely traveled author of guidebooks and the newsletter *Very Special Places*, routes as many trips as possible via Schiphol to buy his beloved Drakkar aftershave.

**Soviets Blaze Sky Trail over Top of World.** Von Hardesty is curator of the National Air and Space Museum's Aeronautics Department.

**Has the Levanovsky Mystery Been Solved?** Everett A. Long, a crash-and-rescue firefighter at Fairbanks International, writes a column on general

aviation for *The Fairbanks Daily News Miner*.

Further reading: *Unsolved Mysteries of the Arctic*, V. Stefansson, Macmillan, 1939.

**Up from Africa.** Robert Caputo, who specializes in wildlife photography, has spent the past 15 years working in Africa on writing and photography assignments for Time-Life Books and *National Geographic*.

Further reading: *Winds of Mara*, Colin Fletcher, Knopf, 1973.

**The California Rocket Race.** T.A. Heppenheimer is the author of *The Man-Made Sun: The Quest for Fusion Power* (Little, Brown & Co., 1984).

**The Flight Against Evil.** Jay P. Spenser, an avid birder and private pilot, is curator of the new Museum of Flight in Seattle.

**Flexible Fliers.** Michael Rozek, a frequent contributor to *Air & Space/Smithsonian*, lives in Spokane, Washington.

Further reading: *Manbirds*, Maralys Wills, Prentice Hall Press, 1981.

**Seeing Red.** Stephen P. Maran, an investigator of stars, nebulae, and comets, is a senior staff scientist at NASA's Goddard Space Flight Center. The views expressed are his own.

Further reading: "The Cool Sky," S. Willner, in *Infinite Vistas: New Tools for Astronomy*, edited by J. Cornell and J. Carr, Charles Scribner's Sons, 1985.

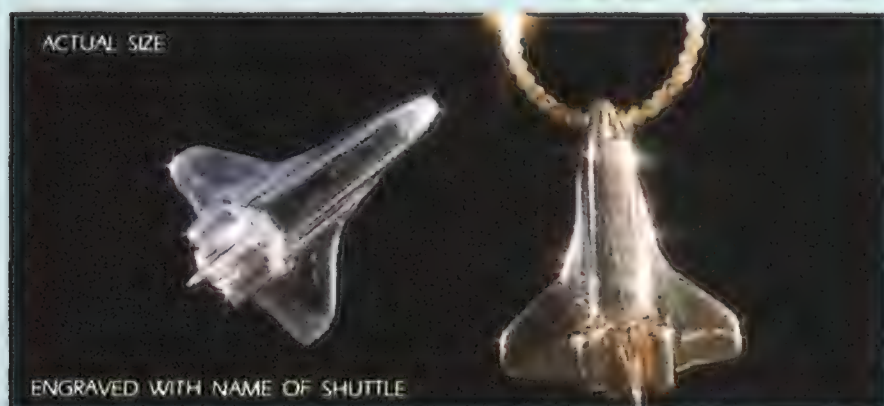
**Inside IRAS.** Julie Phillips writes for Ball Aerospace Systems Division, which built and designed IRAS.

**When Pilots See UFOs.** Dennis Stacy, a San Antonio-based photojournalist, edits the monthly *MUFON UFO Journal*.

Further reading: *The Encyclopedia of UFOs*, edited by R. Story, Doubleday, 1980.

**Hang Time.** Richard Corrigan, managing editor of *National Journal*, has a backyard hoop and zero hang time.

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# "The Satellite Sky" Update/4

These regular updates to "The Satellite Sky" chart will enable readers to keep their charts up to date. Additions can be clipped and affixed to the chart at the appropriate altitude.

## New launches



### 90 to 300 MILES

	Cosmos 1881 9-87 TT
	Cosmos 1886 9-87 PL
	Progress 32 9-87 TT

### 300 to 630 MILES

	Meteor 2-16 8-87 PL
-----------------------------------------------------------------------------------	------------------------






### 630 to 1,250 MILES

	Cosmos 1875-80 9-87 PL
	Transit 9-87 VAFB

### 6,200 to 13,700 MILES

	Cosmos 1883-85 9-87 TT
------------------------------------------------------------------------------------	---------------------------

### 21,750 to 22,370 MILES

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## Deletions

### 90 to 300 MILES

Big Bird down 3-84	Progress 27 down 2-25-87
Cosmos 1865 down 8-14-87	Progress 31 down 9-22-87
Cosmos 1866 destroyed	

## Inoperative but still in orbit

### 90 to 300 MILES      300 to 630 MILES

Cosmos 1860	Cosmos 1633 Cosmos 1703 Cosmos 1707 Cosmos 1821
-------------	----------------------------------------------------------

## Launched but not in orbit

### 90 to 300 MILES

PRC 21 China research	9-9-87	down 9-17-87
Cosmos 1872 USSR photo recon	8-19-87	down 8-30-87
Cosmos 1873 USSR research	8-28-87	down 9-14-87
Cosmos 1874 USSR photo recon	9-3-87	down 9-17-87
Cosmos 1882 USSR earth sensors	9-15-87	down 10-6-87
Cosmos 1887 USSR research	9-29-87	down 10-12-87

## Correction to first Update (June/July 1987)

Cosmos 1812 (300 to 630 MILES), printed correctly on the poster as an *electronic surveillance* satellite, was inadvertently listed as a new launch of a *surveillance* satellite.

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(signed) Carey O. Randall  
Associate Publisher, Administration



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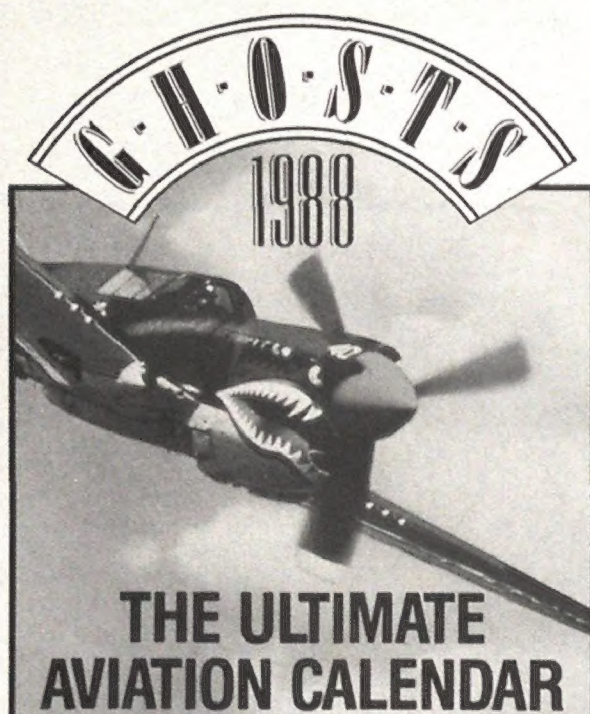


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## Forecast

### In the Wings...

Kevin Murphy

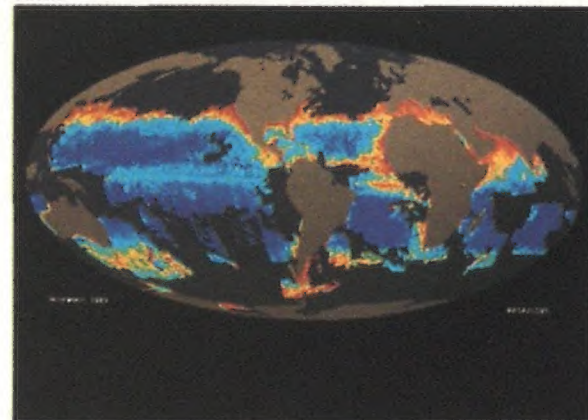


**Cattle Roundups, Aussie-Style**—Down Under, where rangeland is often too vast for horses or even jeeps to work, the question "Where's the beef?" is answered with not a whopper but a chopper. "Helimustering" livestock makes for long, dusty, dangerous days in the Outback. But herding by helicopter has helped John Weymouth, founder of Heli-muster Ltd. in Australia's Northern Territory, create an aviation empire.

**Satellites from Sriharikota**—India has invested over \$1 billion in space research and facilities. Already, Insat-1B has transformed telecommunications on the subcontinent, bringing television to remote villages and improving long-distance telephone service. But Prime Minister Rajiv Gandhi and his countrymen have even more ambitious plans for their nation's space program. As a retired Indian space program official says, "How has the poor man in India benefited? We must answer: Not a lot yet. But he has hope."

**Williams' World**—Robert Williams, the man behind the plan to build an aerospace plane, once aimed a needle-nosed model down a conference table straight at Caspar Weinberger—and gave it a shove. Williams says he just wanted to keep the jet-lagged Secretary of Defense from nodding off.

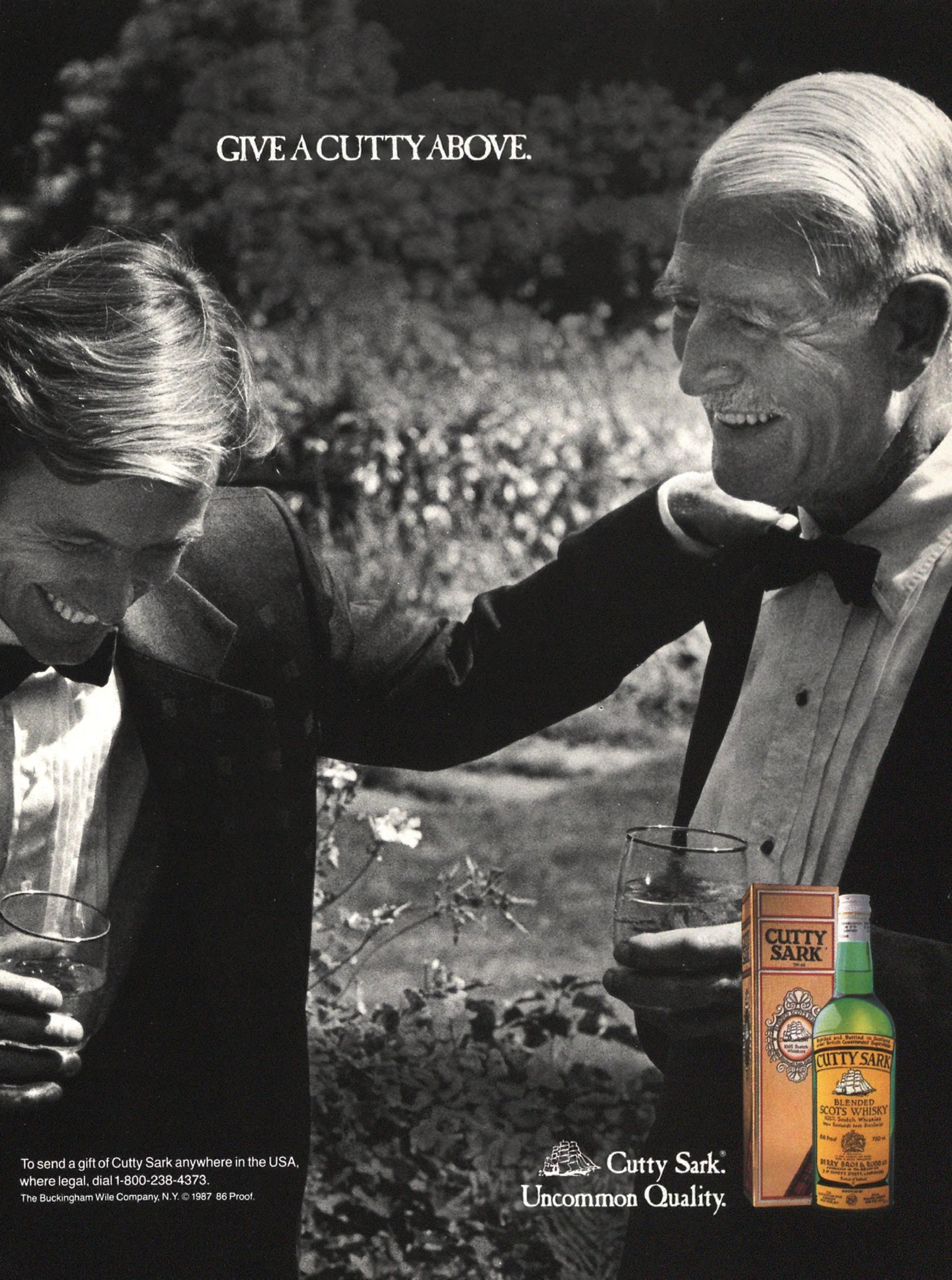
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